A Review of Fractions

Part 1: Simplifying Fractions, Mixed Numbers, and Improper Fractions

Label the fraction below:

$$\frac{4}{5}$$

What is an example of a mixed number?

What is an example of an improper fraction?

First we will discuss how to simplify a fraction. Simplify the following fractions:

a. $\frac{15}{25}$

b. $\frac{60}{150}$

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Simplify the following fractions:

a. $\frac{90}{144}$

b. $\frac{56}{72}$

Next let's talk about how to rewrite an improper fraction as a mixed number.

a. $\frac{55}{10}$

b. $\frac{126}{56}$

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Write the improper fraction as a mixed number.

a. $\frac{210}{120}$

b. $\frac{125}{24}$

c.

Now let's talk about how to convert a mixed number into a fraction. Convert the following mixed numbers into fractions.

a. $4\frac{2}{3}$

b. $3\frac{4}{7}$

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c. $-2\frac{5}{9}$

d. $-4\frac{5}{6}$

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A Review of Fractions

Part 1 - More Practice Problems!

Simplify the following, if possible:

a. $\frac{13}{39}$

b. $\frac{27}{72}$

c. $\frac{36}{99}$

d. $\frac{28}{36}$

e. $\frac{33}{42}$

f. $\frac{300}{525}$

Convert the following from either a mixed number to an improper fraction or an improper fraction to a mixed number.

a. $4\frac{2}{5}$

b. $7\frac{1}{3}$

c. $-5\frac{3}{5}$

d. $\frac{54}{16}$

e. $\frac{72}{14}$

f. $\frac{55}{12}$

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Answer key

First section: a. $\frac{1}{3}$ b. $\frac{3}{8}$ c. $\frac{4}{11}$ d. $\frac{7}{9}$ e. $\frac{11}{14}$ f. $\frac{4}{7}$

Second section: $a.\frac{22}{5}$ $b.\frac{22}{3}$ $c.-\frac{28}{5}$ $d.3\frac{3}{8}$ $e.5\frac{1}{7}$ $f.4\frac{7}{12}$

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A Review of Fractions

Part 2: The Basics of Multiplying, Dividing, Adding, and Subtracting Fractions

What is the rule to multiply 2 fractions?

Multiply the fractions:

a. $\frac{3}{5} \times \frac{7}{10}$

b. $\frac{3}{7} \times \frac{2}{5}$

c. $\frac{4}{5} \times 6$

d. $\frac{2}{3} \times \frac{1}{9}$

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Convert the mixed numbers to improper fractions, then multiply. Simplify the final answer to a mixed number.

a. $3\frac{1}{2} \times \frac{2}{7}$

b. $4\frac{1}{5} \times 3\frac{1}{2}$

c. $5\frac{5}{6} \times 4$

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What is the rule to divide 2 fractions?

Divide the following fractions. If there is a mixed number, convert it to an improper fraction and then divide.

a. $\frac{3}{7} \div \frac{2}{5}$

b. $\frac{3}{5} \div \frac{5}{7}$

c. $4 \div \frac{2}{3}$

d. $\frac{2}{3} \div 7\frac{2}{5}$

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Finally, let's discuss adding and subtracting fractions in the easiest case: when there is a common denominator. If two fractions have the same denominator, how do you add them?

Add or subtract the following. Convert any mixed numbers to improper fractions. Simplify your final answer if possible.

a. $\frac{3}{4} - \frac{1}{4}$

b. $\frac{5}{7} + \frac{1}{7}$

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Add or subtract the following. Convert any mixed numbers to improper fractions. Simplify your final answer if possible.

a. $4\frac{1}{7}+\frac{3}{7}$

b. $5\frac{2}{7}-1\frac{2}{7}$

We will discuss some harder problems in the next video!

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A Review of Fractions

Part 2 - More Practice Problems!

Multiply or divide:

a. $\frac{4}{5} \times \frac{3}{5}$

b. $5 \times \frac{3}{4}$

c. $\frac{10}{11} \times \frac{5}{7}$

d. $-4\frac{3}{4} \times \frac{3}{7}$

e. $5\frac{2}{3} \times 6\frac{1}{2}$

f. $\frac{5}{6} \div \frac{7}{11}$

g. $4 \div \frac{2}{5}$

h. $\frac{5}{6} \div 7$

i. $2\frac{1}{3} \div \frac{5}{7}$

j. $3\frac{1}{4} \div \frac{2}{5}$

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Add or subtract. Simplify any improper fractions to mixed numbers.

a. $\frac{4}{5}-\frac{1}{5}$

b. $3\frac{1}{2}-\frac{3}{2}$

c. $6\frac{1}{3}-7\frac{2}{3}$

d. $2\frac{2}{5}+\frac{3}{5}$

e. $7\frac{1}{7}-2\frac{3}{7}$

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Answer key

First section:

$a.\frac{12}{25}\ b.\frac{15}{4}\ c.\frac{50}{77}\ d.-\frac{57}{28}\ e.\frac{221}{6}\ f.\frac{55}{42}\ g.10\ h.\frac{5}{42}\ i.\frac{49}{15}\ j.\frac{65}{8}$

Section section:

$a.\frac{3}{5}\ b.2\ c.-\frac{4}{3}\ d.3\ e.\frac{33}{7}$

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A Review of Fractions

Part 3: Advanced Fraction Operations with Multiplying, Dividing, Adding, and Subtracting

Before we begin this video, let's review what we discussed in the last video. If you can't do these and did not watch part 1, you should go back and work through that video first!

a. $3\frac{1}{5} - \frac{2}{5}$

b. $\frac{4}{7} \div \frac{3}{5}$

c. $5 \times \frac{2}{7}$

d. $4 \div \frac{3}{5}$

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Now we will focus on some more complicated types of fraction problems. First we will focus on multiplication and division.

Using the example: $\frac{44}{70} \times \frac{35}{66}$, show how you can simplify this problem *before* you multiply.

With division problems, what must you do first *before you simplify?*

Using the example $\frac{66}{70} \div \frac{33}{49}$, show how to simplify this problem to make it easier to evaluate.

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Evaluate the following. Simplify where possible.

a. $\frac{14}{25} \times \frac{15}{28}$

b. $\frac{15}{18} \div \frac{20}{24}$

c. $14 \times \frac{2}{21}$

d. $2\frac{1}{6} \div 4\frac{1}{2}$

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Now let's focus on fractions that do not have a common denominator.

Explain how to get a common denominator when adding: $4 + \frac{2}{3}$

Get a common denominator to add the following. You do not need to simplify the improper fraction.

a. $5 - \frac{2}{7}$

b. $6 + \frac{3}{4}$

Now we will discuss a general strategy for how to add fractions with two different denominators. What is the goal when determining the common denominator between 2 fractions?

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If you find the wrong denominator, that is okay on the ALEKS exam as long as you simplify your final answer. The worst that happens is that you've created a few extra steps of work for yourself.

Find the common denominator between the following pairs of fractions. Also write out your reasoning – it is important to write this out so that you don't forget!

a. $\frac{1}{6}, \frac{1}{10}$

b. $\frac{1}{14}, \frac{1}{21}$

c. $\frac{1}{24}, \frac{1}{36}$

d. $\frac{1}{50}, \frac{1}{35}$

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Now that we have a general strategy to find a common denominator, let's discuss how to actually use that to write 2 equivalent fractions with a common denominator.

Show how we can rewrite $\frac{1}{2} + \frac{1}{3}$ with a common denominator.

Show how we can rewrite $\frac{5}{12} + \frac{3}{20}$ with a common denominator.

Can you simplify *before* you add or subtract two fractions? Draw a stick figure yelling this response at you – you are more likely to remember this important fact 😊

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Add or subtract the following. Simplify any improper fraction as a mixed number.

a. $\frac{5}{12} - \frac{3}{16}$

b. $\frac{7}{24} - \frac{5}{16}$

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A Review of Fractions

Part 3 - More Practice Problems!

Complete the following operations. You *do not* need to simplify any improper fractions as mixed numbers.

a. $\frac{15}{36} \times \frac{27}{35}$

b. $\frac{16}{35} \times \frac{28}{32}$

c. $\frac{14}{15} \div \frac{6}{10}$

d. $\frac{21}{24} \div \frac{49}{50}$

e. $12 \times \frac{5}{10}$

f. $\frac{24}{26} \div 16$

g. $\frac{15}{16} \div \frac{25}{28}$

h. $\frac{18}{30} \div \frac{21}{35}$

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Add or subtract. Your final answer should be simplified. Convert improper fractions to mixed numbers for your final answer.

a. $4 - \frac{5}{6}$

b. $\frac{7}{10} + \frac{4}{15}$

c. $\frac{3}{8} + \frac{5}{12}$

d. $\frac{3}{14} + \frac{8}{21}$

e. $\frac{7}{18} - \frac{11}{24}$

f. $\frac{5}{24} - \frac{5}{16}$

g. $\frac{7}{12} + \frac{5}{28}$

h. $\frac{5}{63} + \frac{2}{81}$

i. $\frac{5}{56} + \frac{7}{24}$

j. $\frac{5}{72} + \frac{7}{81}$

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Answer key

First section:

$a.\frac{9}{28}, b.\frac{2}{5}, c.\frac{14}{9}, d.\frac{25}{28}, e.6, f.\frac{3}{52}, g.\frac{21}{20}, h.1$

Second section:

$a.3\frac{1}{6}, b.\frac{29}{30}, c.\frac{19}{24}, \frac{25}{42}, e.-\frac{5}{72}, f.-\frac{5}{48}, g.\frac{16}{21}, h.\frac{59}{567}, i.\frac{8}{21}, j.\frac{101}{648}$

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A Review of Decimals

Explain how to multiply: 24×13

Now explain how to multiply: 2.4×0.13

Multiply the following:

a. 4.23×5

b. 3.2×0.122

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Explain how to divide: $504 \div 42$

Now explain how to divide: $5.04 \div 42$

Now explain how to divide: $50.4 \div 4.2$

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Divide:

a. $4.25 \div 0.5$

b. $12.3 \div 4.1$

c. $0.6 \div 0.04$

d. $1.2 \div 3$

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A Review of Decimals for the ALEKS Exam – More Practice

Multiply or divide the following.

a. 1.2×5	g. $2.3 \div 1.4$
b. 3.24×1.5	h. $2.72 \div 3.1$
c. 7×1.22	i. $5.25 \div 0.05$
d. 4.01×1.231	j. $3.36 \div 0.03$
e. 0.52×3.1	k. $4.2 \div 2.02$
f. $5 \div 0.25$	l. $6.09 \div 0.003$

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Answer key:

$a.\ 6\ b.\ 4.86\ c.\ 8.54\ d.\ 4.93631\ e.\ 1.612\ f.\ 20\ g.\ 1.642857\ h.\ 0.877419\ i.\ 105\ j.\ 112\ k.\ 2.0792\ l.\ 2030$

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A Review of The Order of Operations for the ALEKS Exam

What is the order of operations? Label it properly with any particular notes.

Explain how to think about the following example: $10 \div 2 \times 4$

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Simplify the following:

a. $(6-4)\times(2+3)$

b. $24\times(-3+5)$

c. $(4^2\div 2\times 5)+3$

There is one particular application of the order of operations with exponents that is very important to know. Explain the difference between these 2 expressions:

a. $(-3)^2$

b. -3^2

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Now simplify the following:

a. $(-6)^2 \div -2^2$

b. $-4^3 + (-3 \times 2^3) + 10$

c. $[3(2-4)^2 + 1] \times (-3+2) - 1$

d. $(-5 \times 9) \div (-3)^2$

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A Review of The Order of Operations for the ALEKS Exam – *More Practice!*

a. $4(3-2)+5(4+2)$

b. $15 \div 3 \times 6$

c. $4^2 - 3 * 2 + 24 \div 2^2$

d. $(2+4)^2 \div 3 \times 2$

e. $20 \div (4-2)^2 \times 3$

f. $10 \div 2 \times 3 - 6 \times 3 \div 2$

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g. $-2^2 + (-3)^2$

h. $36 \div (-3)^2 \times 4 + 2$

i. $-4^2 + (5 - 7)^3 \div 2$

j. $-3^3 + (-3)^2$

k. $-5^2 + (7 - 4)^3 + (4 - 7)^3$

l. $-2^4 + (-2)^3 + (-3)^2$

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Answer key

$a.\ 34\ b.\ 30\ c.\ 16\ d.\ 24\ e.\ 15\ f.\ 6\ g.\ 5\ h.\ 18\ i.\ -20\ j.\ -18\ k.\ -25\ l.\ 17$

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A Review of Basic Exponent Rules

State the main exponent rules:

Simplify the following using the exponent rules. Your final answer should not contain any negative exponents and all exponents should be evaluated as far as possible.

a. $2^2 * 2^3$	e. $\frac{x^3}{x^8}$
b. $x^7 * x^8$	f. 2^{-3}
c. $(x^4)^7$	g. $x^{-5}y^3z^{-8}$
d. $\frac{x^6}{x^2}$	h. $3x^3y^6 * 2x^5y^7$

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i. $(4x^3y^2)^2$

n. $\frac{4a^{-3}b^3c^{-7}d^7}{e^{-8}f^{-2}gh^{-3}}$

j. $(4x^3y^2)^{-2}$

o. $(-3x^{-3}y^4z^{-2})^3$

k. $(4x^{-3}y^2)^2$

p. $(-5x^{-2}y^4z^3)^2$

l. $(4x^{-3}y^2)^{-2}$

q. $\frac{10x^{-3}y^7}{2x^{-4}y^{-3}}$

m. $\frac{5x^{-4}y^7}{10x^3y^{-4}}$

r. $\left(\frac{5x^3y^3}{y^{-2}z^2}\right)^2$

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A Review of Basic Exponent Rules– *More Practice!*

a. $x^7y^3 * -3x^2y^5z^3$

b. $(3x^6y^7)^2$

c. $\frac{15x^7y^3z^9}{3x^2y^8z^4}$

d. $\frac{3a^{-2}b^4c^{-8}d^3}{4e^{-3}f^6g^{-2}h}$

e. $\frac{3x^2y}{6x^7y^4}$

f. $(-3x^3y^2) * (2xy^2)$

g. $(5x^{-2}y^{-3}z)^{-3}$

h. $4x^{-6}y^3z^{-2} * -3x^{-4}y^{-4}z^6$

i. $\left(\frac{3x^8}{2y^7}\right)^2$

j. $\left(\frac{3x^3y^7}{6x^5y^2}\right)^3$

k. $(-3x^2y^{-4})^{-3}$

l. $\left(\frac{5x^4y^{-2}}{2x^6y^4}\right)^3$

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Answer key

$a.-3x^9y^8z^3$ $b.9x^{12}y^{14}$ $c.\frac{5x^5z^5}{y^5}$ $d.\frac{3b^4d^3e^3g^2}{4a^2c^8f^6h}$ $e.\frac{1}{2x^5y^3}$ $f.-6x^4y^4$

g. $\frac{x^6y^9}{125z^3}$ $h.\frac{-12z^4}{x^{10}y}$ $i.\frac{9x^{16}}{4y^{14}}$ $j.\frac{y^{15}}{8x^6}$ $k.\frac{y^{12}}{-27x^6}$ $l.\frac{125}{8x^6y^{18}}$

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A Review of Basic Exponent Rules – *More Practice – Harder Problems!*

a. $\left(\frac{5x^{-4}y^{3}}{z^{-3}}\right)^{2}$

b. $\frac{(4x^{3}y^{2})^{2}}{6x^{4}y^{10}}$

c. $(-3x^{2}y^{-3})^{2} * 5x^{-3}y^{9}$

d. $\frac{(5x^{3}y^{7})^{2}}{10x^{-3}y^{-6}}$

e. $\left(\frac{6x^{2}y^{5}}{4x^{6}y^{2}}\right)^{3}$

f. $\left(\frac{10x^{-3}y^{6}}{15x^{5}y^{-2}}\right)^{3}$

g. $\left(\frac{5x^{-3}y^{-7}z^{5}}{x^{5}y^{3}z^{6}}\right)^{-2}$

h. $\left(\frac{6x^{-3}y^{-8}z^{5}}{8x^{-2}y^{6}z^{-3}}\right)^{-2}$

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Answer key

$a.\frac{25y^6z^6}{x^8}$ $b.\frac{8x^2}{3y^6}$ $c.45xy^3$ $d.\frac{5x^9y^{20}}{2}$ $e.\frac{27y^9}{8x^{12}}$ $f.\frac{8y^{24}}{27x^{24}}$ $g.\frac{x^{16}y^{20}z^2}{25}$ $h.\frac{16x^2y^{28}}{9z^{16}}$

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A Review of Solving Linear Equations for the ALEKS Exam

What are like terms?

Which of the following are like terms?

2x 5y 7 8x 2 -4x 7y 8z

What is the most basic strategy for solving many types of linear equations?

Solve the following linear equations:

$3x - 9 = 6$

$4x - 7 = 13 - 6x$

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Solve the following:

$4(x+5)-1=3(x+2)-2(2x+4)$

Below are 2 unusual results that can occur with linear equations. Show how to interpret the unusual results.

$3(x+2)+1=3x+7$

$5(2x-4)+2x=6(2x+2)$

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Now let's discuss what to do when fractions or decimals are present in the equation.

First we will discuss how to clear decimals.

$0.02x + 0.3 = 0.12 + 0.04x$

$0.04(2x - 4) + 0.05(x + 3) = 0.1(x - 4)$

$0.6(3x + 1) - 2(1 + 2x) = 0.6(3x - 1)$

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Now let's discuss how to clear fractions. To do this, you will need to know how to find the LCD between several fractions.

$\frac{1}{15}x - \frac{1}{2} = \frac{1}{5}x - \frac{3}{10}$

$\frac{2}{3}(3x - 5) + 1 = \frac{3}{2}(x - 2) + \frac{1}{6}x$

$\frac{5}{6} - \frac{3}{4}(x + 2) = \frac{1}{2}x + \frac{7}{12}$

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A Review of Solving Linear Equations– *More Practice with Harder Equations!!!*

a. $4x - 6 + 5 = 5(2x + 1) - 6x + 7$

b. $3(2x + 4) - 2(5x - 4) = 4(3x - 2) + 12$

c. $0.2(3x - 1) + 1.8 = 0.55(2x + 4)$

d. $\frac{1}{3}(3x - 5) - \frac{2}{5}(x - 2) = \frac{1}{6}(2x - 1) - \frac{2}{3}$

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e. $1.2(x+4)-0.5=3(x-1)+0.9x$

f. $\frac{1}{2}-\frac{1}{6}(x-5)=\frac{1}{3}(x+1)+\frac{2}{3}$

g. $\frac{1}{3}(2x+1)-\frac{4}{3}=-\frac{5}{9}$

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Answer key

a. no solution b. 1 c. -1.2 d. $\frac{1}{8}$ e. 2.7037 f. $\frac{2}{3}$ g. $\frac{2}{3}$

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A Review of Solving Linear Equations– *More Practice with Harder Equations!!!*

a. $4x - 6 + 5 = 5(2x + 1) - 6x + 7$

b. $3(2x + 4) - 2(5x - 4) = 4(3x - 2) + 12$

c. $0.2(3x - 1) + 1.8 = 0.55(2x + 4)$

d. $\frac{1}{3}(3x - 5) - \frac{2}{5}(x - 2) = \frac{1}{6}(2x - 1) - \frac{2}{3}$

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e. $1.2(x+4)-0.5=3(x-1)+0.9x$

f. $\frac{1}{2}-\frac{1}{6}(x-5)=\frac{1}{3}(x+1)+\frac{2}{3}$

g. $\frac{1}{3}(2x+1)-\frac{4}{3}=-\frac{5}{9}$

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Answer key

a. no solution b. 1 c. -1.2 d. $\frac{1}{8}$ e. 2.7037 f. $\frac{2}{3}$ g. $\frac{2}{3}$

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A Review of Linear Inequalities

Sometimes ALEKS will ask you to graph an inequality. Let's review how to do that.

ALEKS uses open and closed dots on the number line. Some classes teach to use (or].

Graph $x \geq 3$. State your answer also in interval notation.

Graph $x < -5$. State your answer also in interval notation.

Graph $x \leq 0$. State your answer also in interval notation.

Graph $-2 \leq x < 4$. State your answer also in interval notation.

Solving linear inequalities works mostly similarly to solving equations, except for one catch. What do you have to watch out for when working with inequalities?

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Solve the following linear inequalities. Graph your solution on the number line.

a. $3x > 12$

b. $-5x \leq 15$

c. $3x \leq -18$

d. $5 - 2x \geq 7$

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Solve the following. You do NOT need to put your final answer on the number line.

a. $4x - 12 > 0$

b. $5 - x \leq 2$

c. $7x + 5 \leq 3x - 9$

d. $36 \geq 4x - 8$

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Some of the situations that we discussed with linear equations can also happen with linear inequalities. This is a good moment to review some skills from the previous lesson. Solve the following. You do NOT need to put your final answer on the number line.

a. $2(x+3)-(x-1)>8-(x+9)$

b. $\frac{1}{4}x-\frac{5}{2}\leq-\frac{1}{2}x-1$

c. $6.1\leq-0.55x+6.1$

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Finally, let's see what to do when there are multiple inequality signs. Solve the following:

a. $-4 \leq 2x < 8$

b. $6 \leq 4x - 2 < 14$

c. $-2 < 5x + 3 \leq 13$

d. $-3 \leq 5 - 2x < 9$

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A Review of Linear Inequalities– ***More Practice!!!***

Graph the following inequalities and also state the answer in interval notation.

a. $x < 8$	d. $x \geq 1$
b. $x \geq -3$	e. $-3 \leq x \leq 6$
c. $x < -2$	f. $2 < x \leq 8$

Now solve the following. You do not need to graph your answers nor state in interval notation.

a. $4 - 6x \leq 16$

b. $3x + 1 > 5x - 9$

c. $-3 \leq 2x + 1 \leq 7$

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Solve the following. You do not need to graph your answer this time.

a. $4x - (3x + 5) \leq x - 10$

b. $-\frac{5}{9}x + \frac{11}{12} < \frac{23}{36}$

c. $8.7x + 4.33 \leq -2.4x - 33.41$

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d. $\frac{1}{2}(x-3)+\frac{3}{4}x \leq \frac{1}{2}(2x+3)+\frac{3}{8}$

e. $0.04x + 0.12(10-x) < 8$

f. $2 < \frac{3}{4}x + 8 \leq 11$

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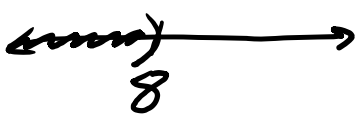
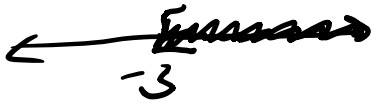
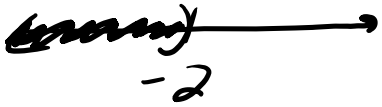
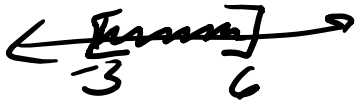
Number line	Interval Notation
a) 	$(-\infty, 8)$
b) 	$[-3, \infty)$
c) 	$(-\infty, -2)$
d)	$[1, \infty)$
e) 	$[-3, 6]$
f)	$(2, 8]$

Other section:

$a. x \geq -2, b. x < 5, c. -2 \leq x \leq 3, d. x \geq 5, e. x > \frac{35}{4}, f. x \leq -\frac{17}{5}\ or\ -3.4, g. x \leq \frac{27}{2}, h. x > -85, i. -8 \leq x \leq 4$

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A Review of Lines

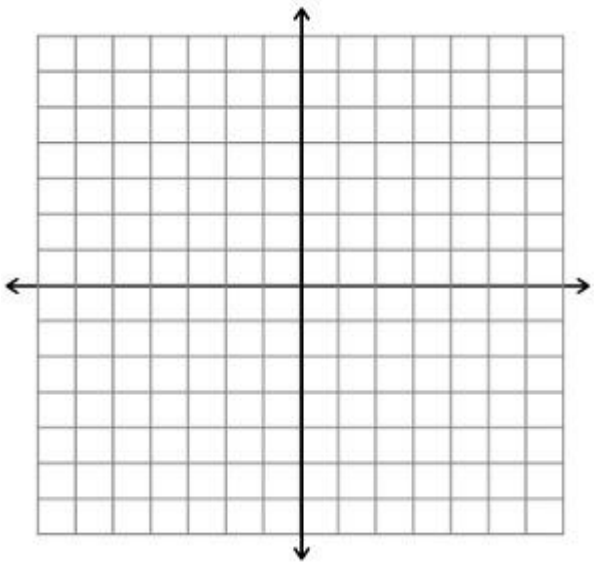
Part 1: Graphing Lines and Working with Points and Intercepts

An equation of a line typically comes in one of three forms. Write them down:

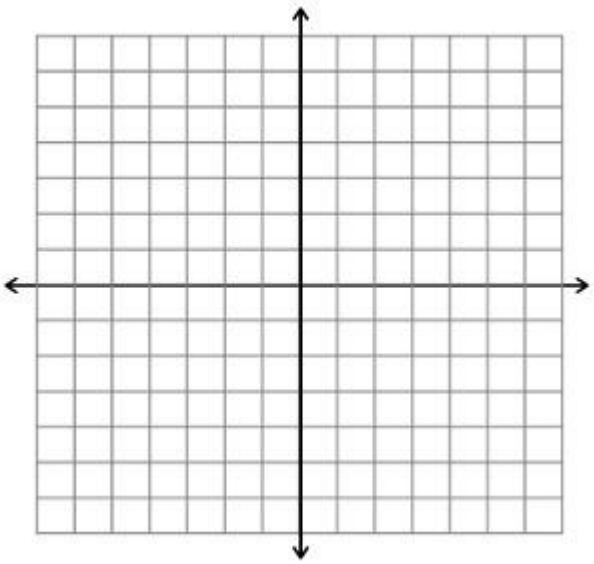
Every line has a slope. What is a slope?

Graph a line that goes through the point $(-2,3)$ with the given slopes:

Slope $m = \frac{1}{2}$



Slope $m = -3$



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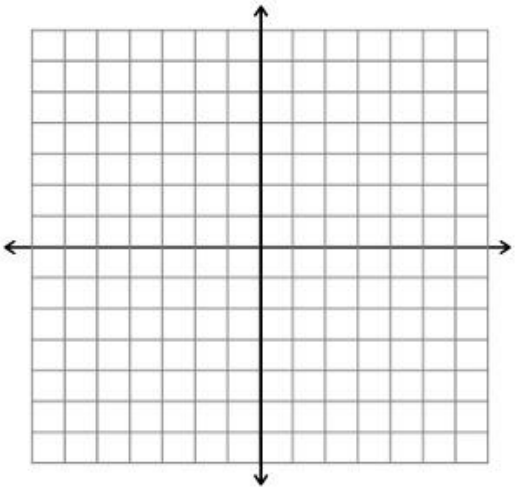
Graph a line that goes through the point $(0, -1)$ that has slope $m = -\frac{1}{2}$. Circle where the x- and y-intercept are.



The x-intercept is where the line crosses the x-axis. The y-intercept is where the line crosses the y-intercept.

In the slope-intercept form and point-slope form of a line, it is easy to find in the slope. In each equation, note where the slope can be found.

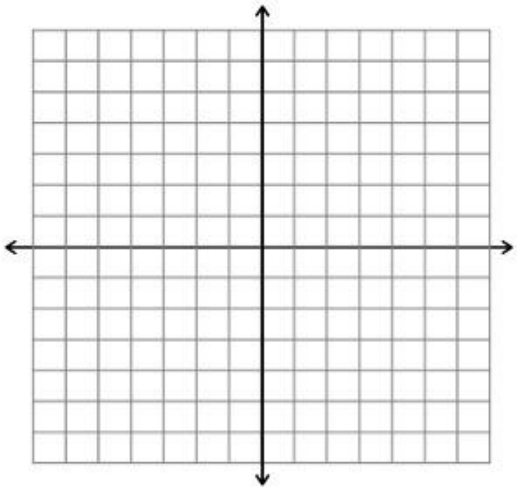
$y = mx + b$ $\qquad\qquad$ $y - y_1 = m(x - x_1)$

It is also obvious in each equation what point to use *if you recall how to read these equations*. Let's dissect each equation.

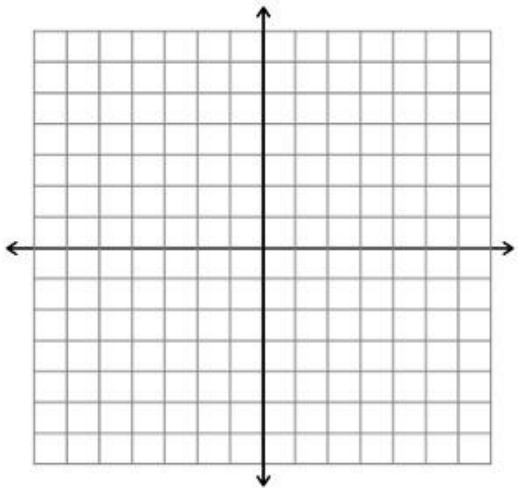
For $y = mx + b$, what is the other point you can use?

For each equation, state what the slope and y-intercept are of the equation. Then graph the line.

a. $y = -3x + 2$



b. $y = \frac{2}{3}x - 4$



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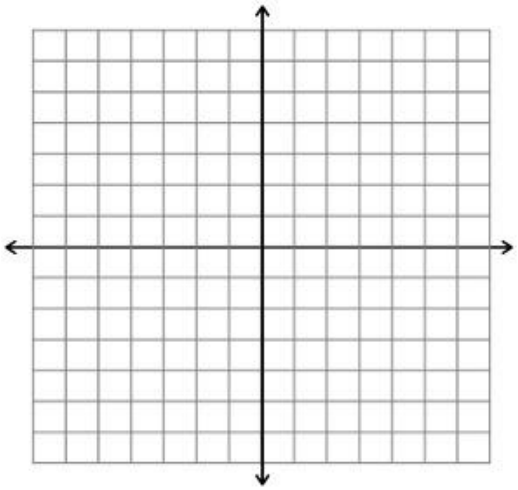
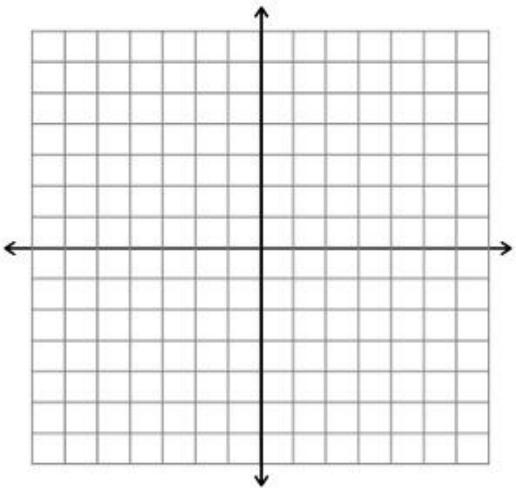
For each equation, state what point and slope are being given in the equation. Then graph the line.

a. $y - 4 = 2(x + 1)$



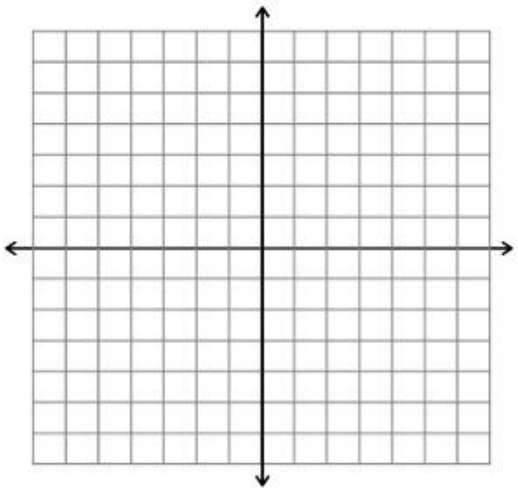
b. $y + 1 = -\frac{1}{2}(x + 2)$



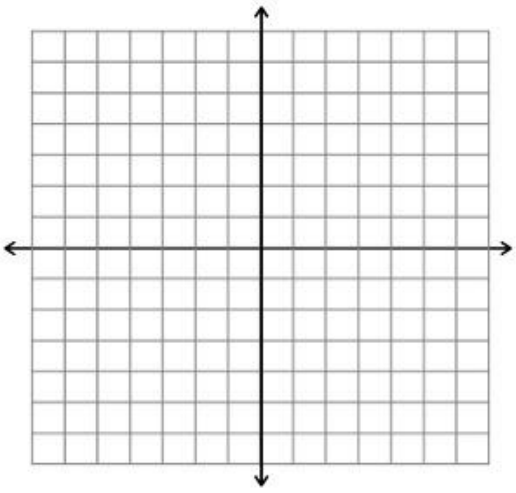
The trickier form of a line is the standard form $Ax + By = C$. If you need to figure out the slope or y-intercept from standard form, you can just solve the equation for y.

Put each equation into slope-intercept form. Then graph the line.

a. $4x - 2y = 6$



b. $3x + 2y = -9$



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What is the general strategy for finding x- and y-intercepts if you aren't sure? Draw a picture to go along with this explanation.

Find the x-intercepts and y-intercepts of each equation.

a. $3x + 6y = 12$

b. $y = 3x - 1$

c. $y - 1 = 2(x + 3)$

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Find the x-coordinate for each line that aligns with $y = 2$.

a. $4x + 2y = 6$

b. $y = 3x - 1$

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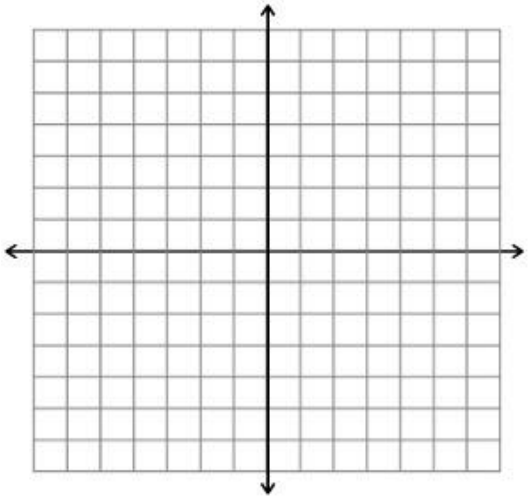
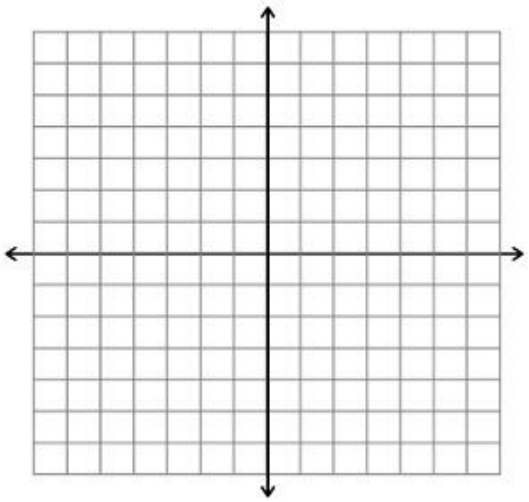
A Review of Lines– ***More Practice on Graphing Lines***

Graph the following.

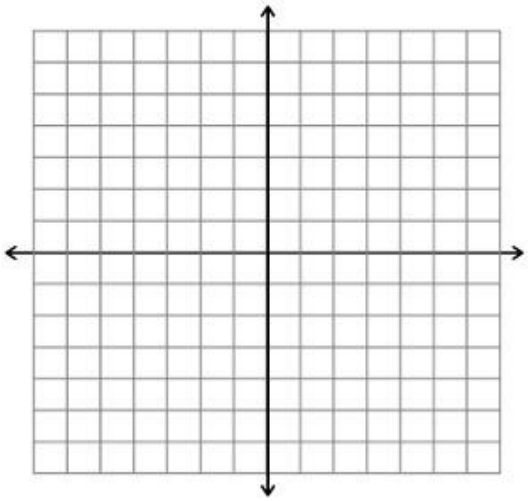
a. $y = 3x - 2$



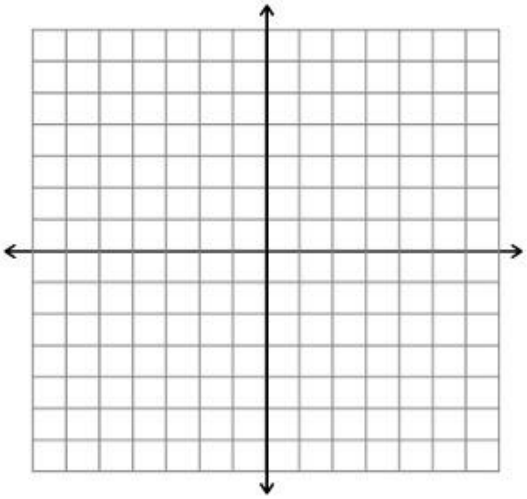
b. $y = -\frac{3}{4}x + 2$



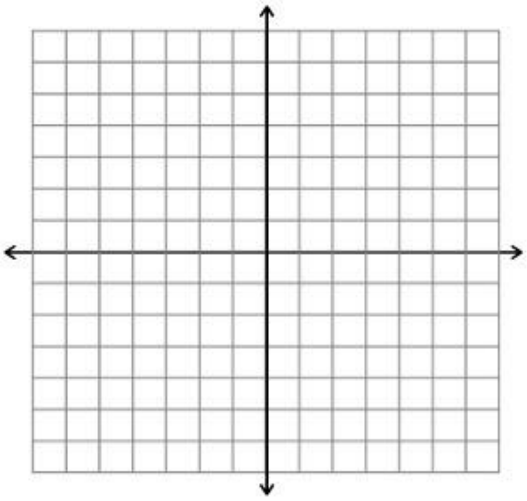
c. $y = 5$



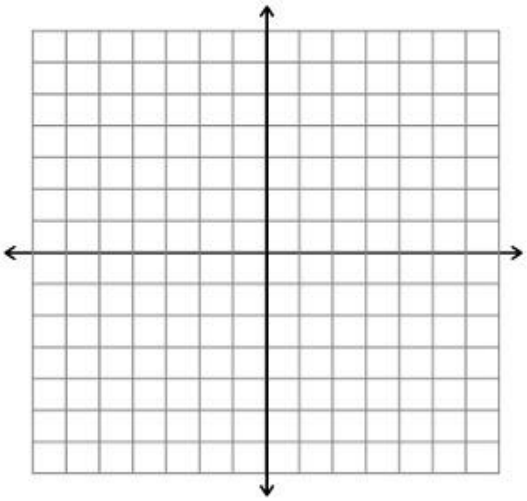
d. $x = 3$



e. $3x - 6y = 12$



f. $2x + 3y = -4$



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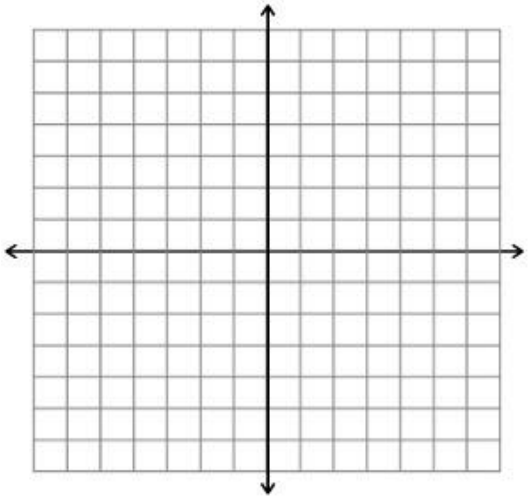
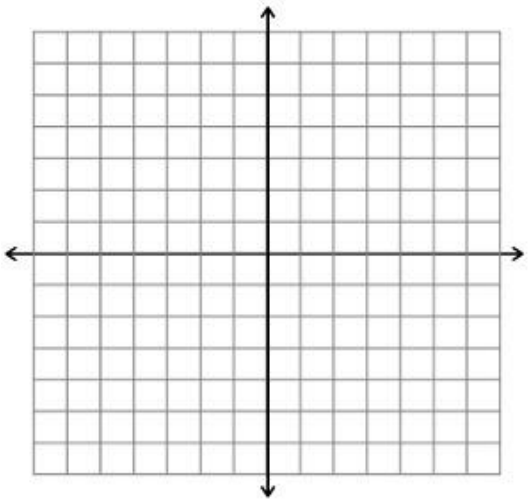
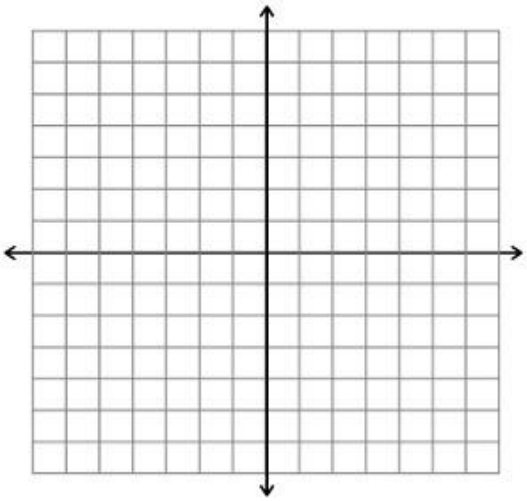
g. $y = -1$



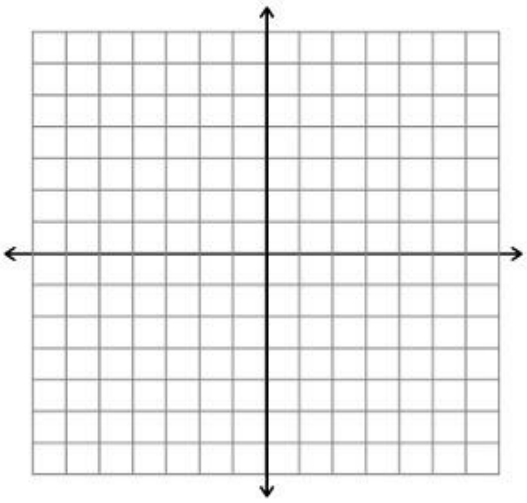
h. $x = 3$



i. $y = -\frac{1}{2}x + 3$



j. $3x - 6y = 4$



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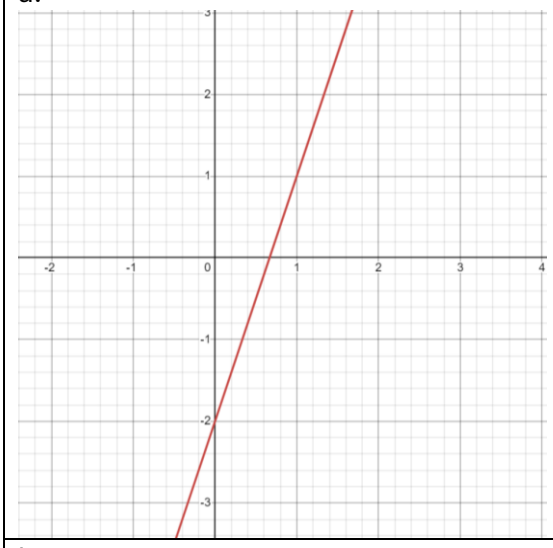
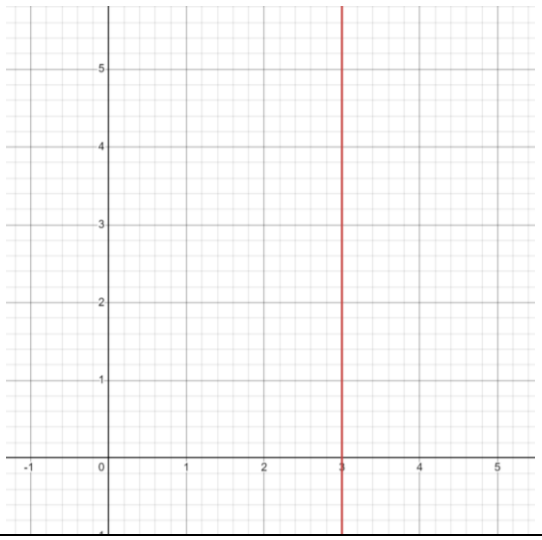
Answer Key

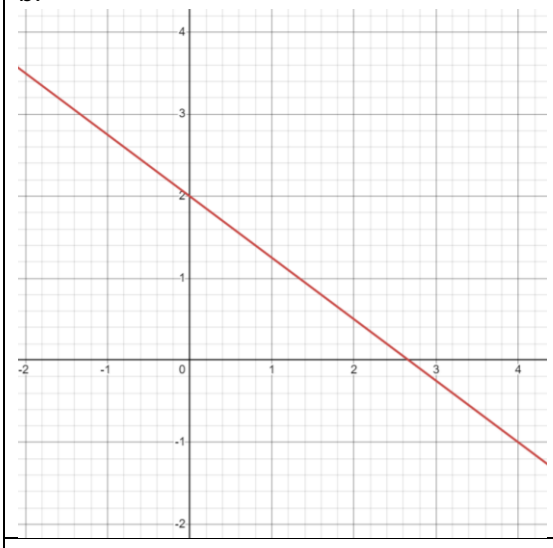
a.



d.



b.



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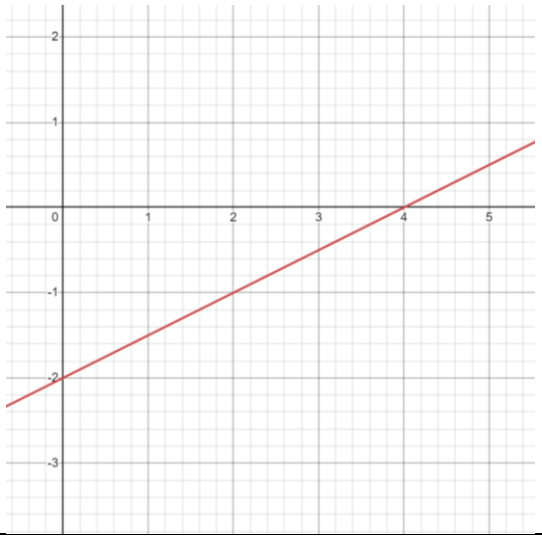

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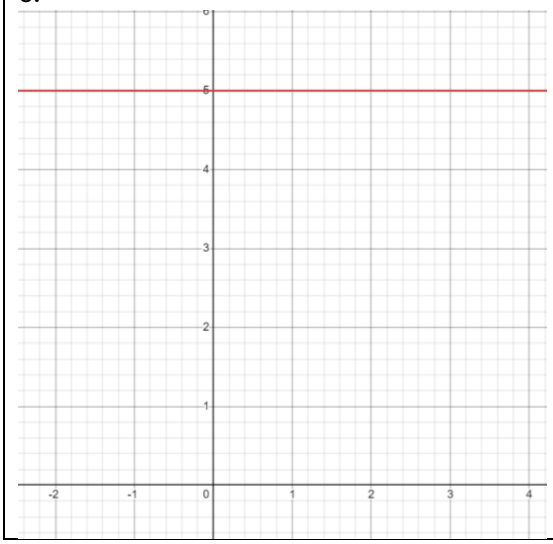

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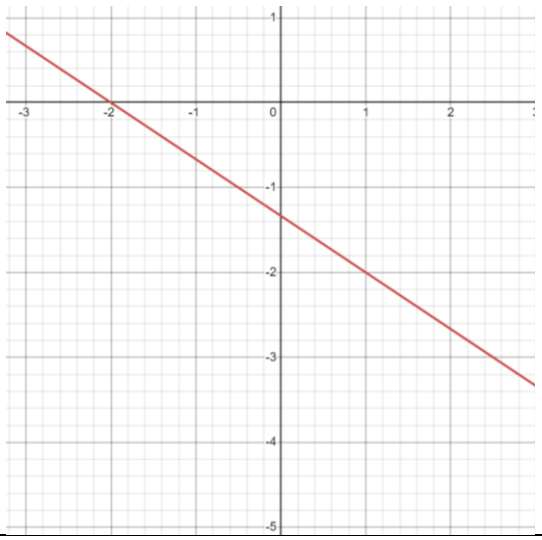

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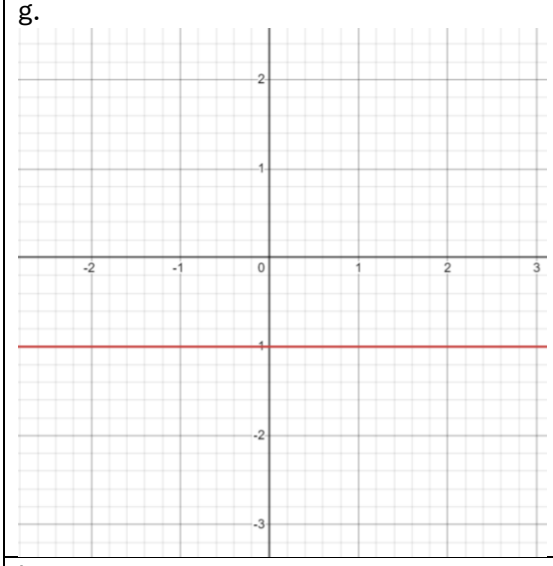
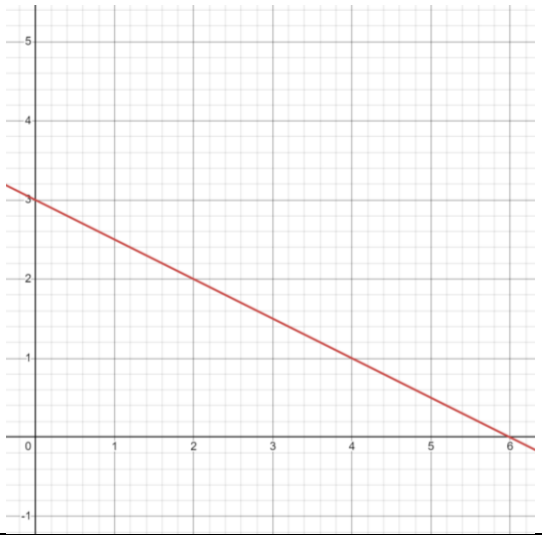
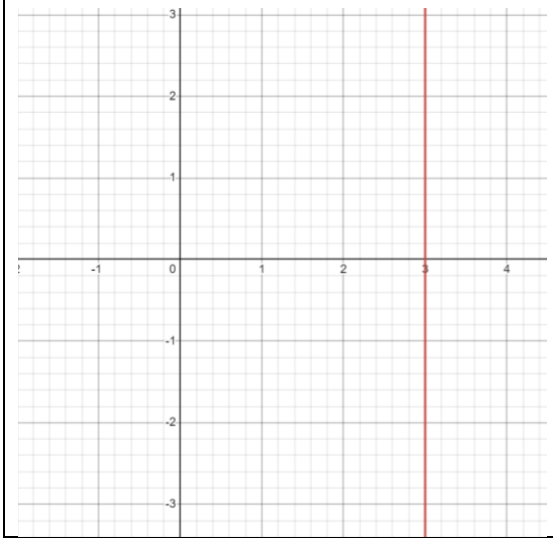
g.



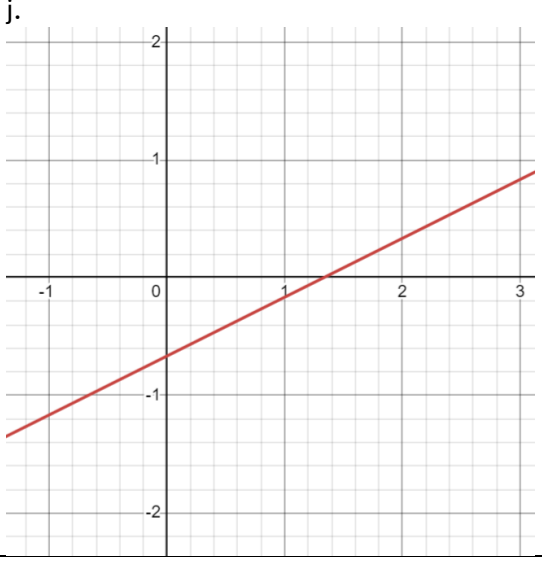
i.



h.



j.



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A Review of Lines– ***More Practice on Working with Points***

Find the corresponding coordinate in each line for the point that contains $x = 2$.

a. $y = 3x + 1$

b. $2x - 4y = 8$

c. $5x + 2y = 7$

Find the x-intercepts and y-intercepts for each equation.

a. $y = 4x + 1$

b. $3x - 6y = 12$

c. $5x + 2y = 8$

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Answer key

First section:

$a.\ (2,7), b.\ (2,-1), c(2,-\frac{3}{2})$

Second section:

a. x-intercept $\left(-\frac{1}{4},0\right)$ y-intercept $(0,1)$

b. x-intercept $(4,0)$ y-intercept $(0,-2)$

c. x-intercept $\left(\frac{8}{5},0\right)$ y-intercept $(0,4)$

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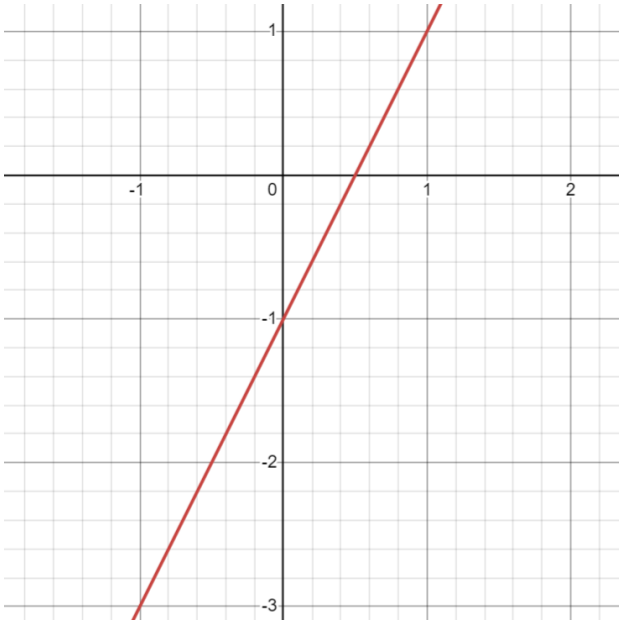
A Review of Lines

Part 2: Slopes, Vertical and Horizontal Lines, and Equations of Lines

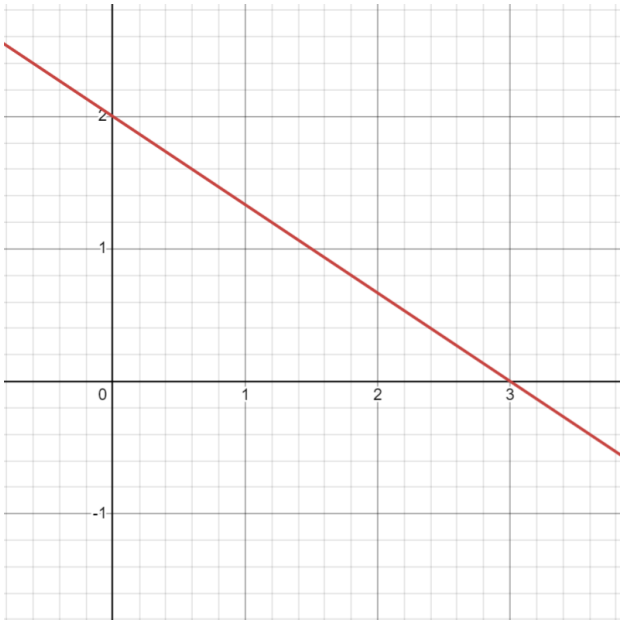
Now we will discuss other ways to find slope.

Show how to find the slope from the graph of the lines. (Graphs are from desmos.com)

a.



b.



There is also a formula to find the slope between 2 points. What is the formula?

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Find the slope between the following sets of points:

a. $(4, 5)$ and $(2, 7)$

b. $(-1, 3)$ and $(-4, 7)$

c. $(4, 5)$ and $(4, 7)$

d. $(3, 6)$ and $(5, 6)$

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What is the equation format for any vertical line? How can you remember this?

What slope does every vertical line have?

What is the equation format for any horizontal line? How can you remember that?

What slope does every horizontal line have?

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Lastly, we need to discuss how to write the equation of lines.

To warm up this skill, write the equation of a line that goes through the point $(4, 5)$ and has slope $m = -2$. Put your final answer in slope-intercept form AND also standard form.

Write the equation of a line that goes through the point $(-2, 3)$ and has slope $m = -\frac{1}{2}$. Put your final answer in slope-intercept form.

Write the equation of a line that goes through the points $(2,3)$ and $(3, 5)$.

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Write the equation of a line that goes through the points $(-2, -3)$ and $(-4, 5)$.

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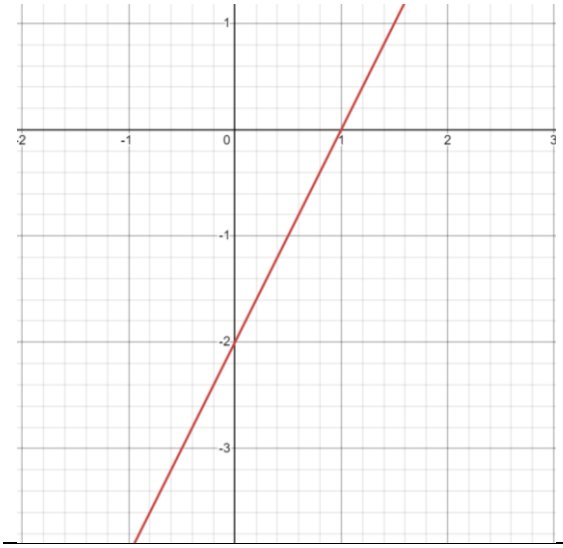
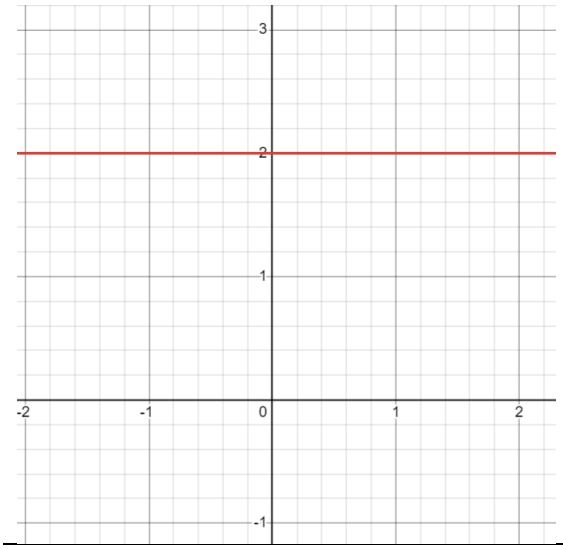
A Review of Lines– ***More Practice on Slope***

Determine the slope of the line from the graph. (Graphs from desmos.com)

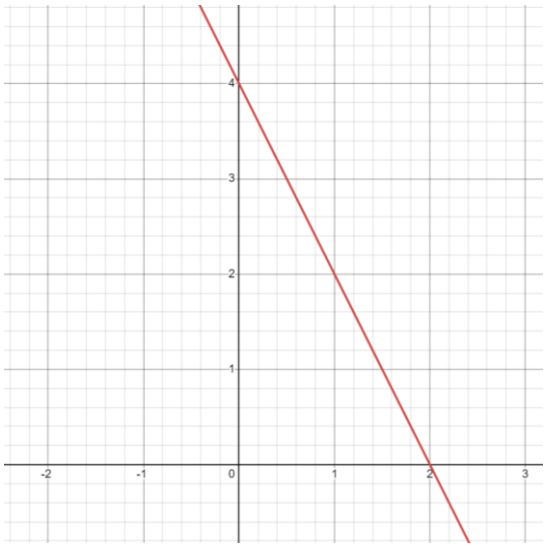
a.



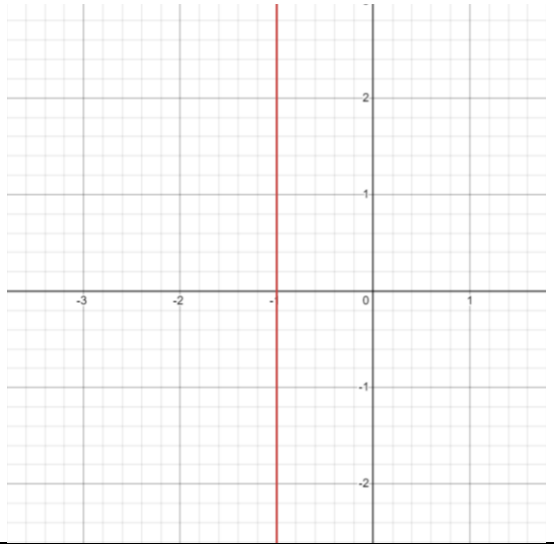
b.



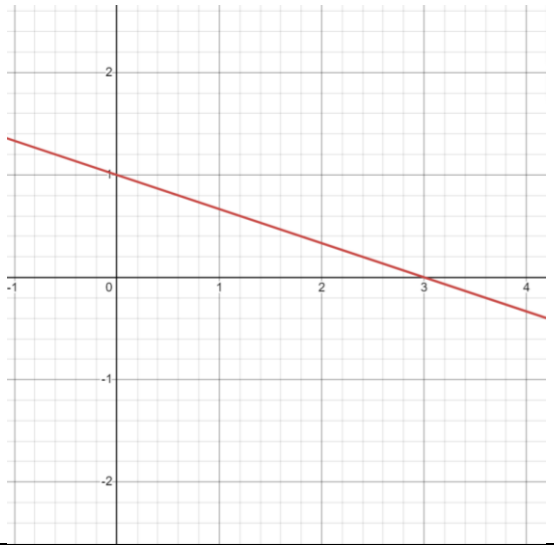
c.



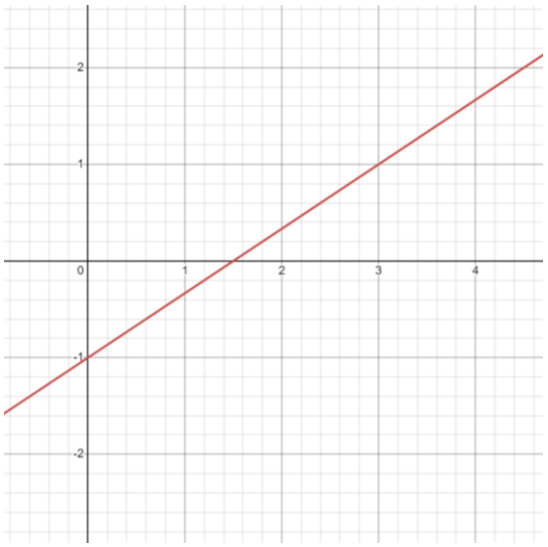
d.



e.



f.



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Use the slope formula to determine the slope between the following sets of points.

a. $(3, 4)$ and $(7, 2)$

b. $(-3, 5)$ and $(-3, 7)$

c. $(-1, -2)$ and $(-3, 4)$

d. $(4, 5)$ and $(-3, 5)$

e. $(-\frac{1}{2}, 3)$ and $(\frac{1}{4}, 2)$

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Answers Key

First portion:

a. 2 b. 0 c. -2 d. undefined e. $-\frac{1}{3}$ f. $\frac{2}{3}$

Second portion:

a. $m = -\frac{1}{2}$ b. undefined c. $m = -3$ d. $m = 0$ e. $m = -\frac{4}{3}$

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A Review of Lines– ***More Practice on Writing Equations of Lines***

Write the equation of a line that goes through the desired point with the given slope. Put your final answer in slope-intercept form.

a. $(3, 5)$ and $m = -4$

b. $(-2, 7)$ and $m = -\frac{1}{2}$

c. $(-3, -2)$ and $m = 2$

d. $(4, 5)$ and $m = 0$

e. $(-3, 5)$ and $m = -\frac{1}{2}$

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Find the equation of a line that goes through the following points. Put your final answer in slope-intercept form.

a. $(3, 4)$ and $(7, 2)$

b. $(-3, 5)$ and $(-3, 7)$

c. $(-1, -2)$ and $(-3, 4)$

d. $(4, 5)$ and $(-3, 5)$

e. $(-\frac{1}{2}, 3)$ and $(\frac{1}{4}, 2)$

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Answer key

first section:

$a.\, y = -4x + 17, b.\, y = -\frac{1}{2}x + 6, c.\, y = 2x + 4, d.\, y = 5\,, e.\, y = -\frac{1}{2}x + \frac{7}{2}$

second section:

$a.\, y = \frac{11}{2} - \frac{1}{2}x, b.\, x = -3, c.\, y = -3x - 5, d.\, y = 5\,, e.\, y = -\frac{4}{3}x + \frac{7}{3}$

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A Review of Systems of Linear Equations

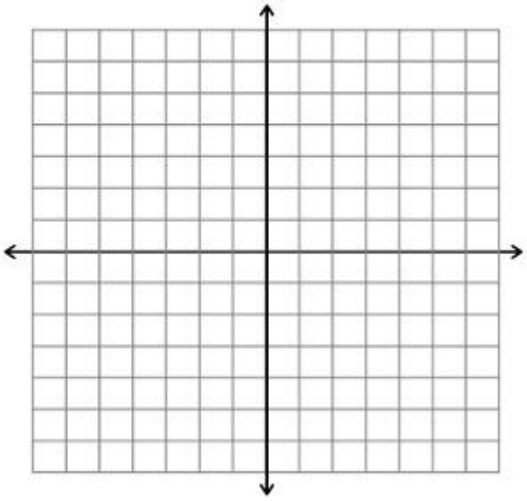
Part 1: Systems with Two Equations and Two Variables

What the three methods that can be used for solving a system of 2 linear equations in 2 variables?

Show how to solve the system by graphing:

$y = x + 2$

$y = 4 - x$



Solve by substitution:

$2x + y = 3$

$4x - y = 9$

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Solve the system of equations using the elimination method:

$$2x - y = 6$$

$$3x + y = 9$$

Chose the best technique to solve the following systems of equations.

a. $4x + 8y = -24$

$-2x - 4y = 12$

b. $x + y = -10$

$3x + 2y = 12$

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c. $-2x + y = 3$

$-4x + 2y = 10$

d. $3x + 2y = 2$

$2x + 3y = -2$

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e. $\frac{1}{2}x - \frac{1}{10}y = \frac{4}{5}$

$\frac{1}{2}x - \frac{1}{6}y = \frac{8}{3}$

f. $0.03x + 0.01y = 0.4$

$0.1x + 0.1y = 2$

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A Review of Systems of Linear Equations– *More Practice*

Part 1: Systems with Two Equations and Two Variables

Solve the following systems of equations.

a. $x - 2y = -3$

$2x + 4y = 8$

b. $x + 8y = 5$

$12x + y = 10$

c. $3x - y = 7$

$3x + 2y = 12$

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d. $5x + 7y = 21$

$3x - 2y = 13$

e. $\frac{1}{3}x - \frac{1}{2}y = \frac{1}{6}$

$-\frac{1}{3}x + \frac{1}{2}y = \frac{1}{6}$

f. $0.2x + 0.1y = 5$

$0.02x - 0.01y = 13.5$

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Answer Key

a. $\left(\frac{1}{2}, \frac{7}{4}\right)$ b. $(-3, -5)$ c. $\left(\frac{26}{9}, \frac{5}{3}\right)$

d. Infinite solutions e. $(2, -4)$ f. $(10, 7)$

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A Review of Polynomials

A polynomial is an expression that has real number coefficients and variables that have positive integer exponents. It's usually easier to understand this by just looking at some examples of what is versus what is not a polynomial.

These are Polynomials

- $3x + 2$
- 8
- $4x^2 + 3x - 1$
- $\pi x^7 - ex^6 + 3.4x^5 + \frac{4}{5}x^9$
- x^8

These are Not Polynomials

- $\sqrt{x} + 2$
- $x^{\frac{2}{3}} - x^3 + 1$
- $\frac{4}{x} + \frac{5}{x^2}$
- x^{π}

Evaluate the following polynomials for $x = -2$

a. $x^2 + 5$

b. $3x^3 - 2x^2 + 5x + 1$

To add or subtract polynomials, you mainly just add like terms. If you are subtracting 2 polynomials, be careful with the negative sign!

a. $(3x^2 + 5x + 7) + (5x^2 - 2x - 3)$

b. $(5x^3 - 2x^2 + 5x + 1) - (4x^3 + 2x^2 - 7x - 3)$

c. $(5x^4 + 2x^3 - 2x^2 + 5x - 6) - (2x^3 + 2x - 8)$

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Basic multiplying of polynomials mainly relies on the rules of exponents. Let's multiply the following.

a. $3x(4x^2 + 5x - 1)$

b. $5x^3(x^2 - 2x + 4)$

To multiply two polynomials together, we need to focus on multiplying every term in one polynomial by every term in the other polynomial. Show how to illustrate this with the following examples:

$$(3x + 1)(5x - 2)$$

$$(x^2 + 5x + 3)(2x - 4)$$

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Multiply the following:

a. $(3x + 4)(5x - 2)$

b. $(5x + 3)(2x - 1)$

c. $(x^2 + 3x + 4)(3x - 1)$

d. $(3x + 1)^2$

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One last type of polynomial multiplication that we should discuss are ones of this form:

a. $(x-3)^2$

b. $(2x+1)^2$

c. $(x^2+3x-1)^2$

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A Review of Polynomials -*More Practice!!*

Evaluate the following polynomials for $x = 4$.

a. $6x - 4$

b. $x^2 - 3x + 2$

c. $\frac{1}{2}x^2 + \frac{1}{4}x - 3$

Add or subtract.

a. $(4x^2 + 3x - 5) + (6x^2 - 5x + 2)$

b. $(5x^3 + 4x^2 - 3x + 5) - (6x^2 + 4x - 7)$

c. $\left(\frac{1}{2}x^2 + 3x + 6\right) - (\frac{1}{3}x^2 + 5x - 1)$

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Multiply the following.

a. $4x(5x + 3)$

b. $2x^2(x^7 - 3x^5 + 5x^2 + 1)$

c. $\frac{1}{2}x^2(4x^3 - 6x^2 + 8x + 5)$

d. $(x + 5)(x + 2)$

e. $(x + 4)(x - 7)$

f. $(x - 6)(x + 6)$

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Multiply the following:

a. $(2x + 1)(x^2 + 3x + 1)$

b. $(x + 4)(2x^2 + 5x + 3)$

d. $(x + 4)^2$

e. $(2x^2 + 3x + 1)^2$

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Answer key

Page 1, First section:

$a.\,20,\ \ b.\,6\,,c.\,6$

Page 1, Second section:

$a.\,10x^2-2x-3,\ \ b.\,5x^3-2x^2-7x+12\,,c.\frac{1}{6}x^2-2x+7$

Page 2:

$a.\,20x^2+12x,\ \ b.\,2x^9-6x^7+10x^4+2x^2,c.\,2x^5-3x^4+4x^3+\frac{5}{2}x^2$

$d.\,x^2+7x+10,\ \ e.\,x^2-3x-28,f.\,x^2-36$

Page 3:

$g.\,2x^3+7x^2+5x+1,h.\,2x^3+13x^2+23x+12,\ \ i.\,x^2+8x+16,\ \ j.\,4x^4+12x^3+13x^2+6x+1$

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A Review of Factoring

Part One: Basic Factoring Review

This is a very brief review of some of the main types of factoring. Factoring is a very large topic, and if you'd like to do an in-depth review of it then I have plenty of videos that do that. In this video, I'm going to review just the easier types.

First, let's talk about factoring out the greatest common factor (GCF).

What is the GCF of $3x + 3y$? Show how to factor this expression.

Factor the following using the GCF:

a. $5x + 10$

b. $5x^2 + 10x$

c. $25x^3y^2 - 15x^2y^3 + 35x^4y^4$

d. $16x^3y^7 + 8x^4y^5$

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The next type of factoring we will discuss is grouping. Explain how grouping works with the example:

$$ax + ay + bx + by$$

Finish the grouping for these examples:

a. $3(x + y) - 5z(x + y)$

b. $4x(3x - 1) + (3x - 1)$

Use grouping to factoring the following:

a. $3x + 3y - 7xz - 7yz$

b. $5x^2 + 10x - 6x - 12$

c. $3x - 6xy - 7z + 14yz$

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Finally, we will discuss factoring trinomials. We will utilize the trial and error method, and we will focus first on trinomials with a leading coefficient of 1 (if you have no idea what it means, basically we are focusing on the easier case for now).

Explain how to thing about factoring: $x^2 + 3x + 2$

Factoring the following:

a. $x^2 + 5x + 6$

b. $x^2 - x - 12$

c. $x^2 + 7x + 12$

d. $x^2 - 2x - 15$

e. $-x^2 + 6x - 16$

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One really common “trinomial” is called the difference of squares. Note the pattern to factor the following:

a. $x^2 - 9$

b. $x^2 - 25$

c. $x^2 - 1$

d. $x^2 + 4$

e. $x^2 - \frac{4}{9}$

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A Review of Factoring– *More Practice with GCF and Grouping*

Part One: Basic Factoring Review

Factor the following using either the greatest common factor (GCF) or grouping.

a. $5x^2 + 10x + 15$

b. $6x^4y^3 - 8x^2y^5 + 12x^5y^4$

c. $5xy - 7z$

d. $28x^5y^3z^5 - 14x^4y^7z + 21x^7y^4z^3$

e. $5(2x - 1) + 7z(2x - 1)$

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f. $3x^2 + 6 + 4x + 2x^3$

g. $x^4 - 2x^3 + 6x - 12$

h. $x^2 + 4x + 3xy + 12y$

i. $20x^2 + 30x - 2xy - 3y$

j. $-15x^2y^2 - 30x^2y + 5x + 10y$

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Answer Key

a. $5(x^2 + 2x + 3)$

b. $2x^2y^3(3x^2 - 4y^2 + 6x^3y)$

c. prime – can't be factored

d. $7x^4y^3z(4xz^4 - 2y^4 + 3x^3yz^2)$

e. $(5 + 7z)(2x - 1)$

f. $(3 + 2x)(x^2 + 2)$

g. $(x^3 + 6)(x - 2)$

h. $(x + 3y)(x + 4)$

i. $(10x - y)(2x + 3)$

j. can't be factored

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A Review of Factoring– ***More Practice with Basic Trinomials (with x^2 only)***

Part One: Basic Factoring Review

Factor the following using either the greatest common factor (GCF) or grouping.

a. $x^2 + 7x + 6$

b. $x^2 + 9x + 20$

c. $x^2 + 17x + 72$

d. $x^2 - 6x + 9$

e. $x^2 - 7x + 12$

f. $x^2 - 15x + 50$

g. $x^2 - x - 12$

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h. $x^2 - 1$

i. $x^2 - 16$

j. $x^2 - 36$

k. $x^2 - 36y^2$

l. $25 - x^2$

m. $25y^2 - x^2$

n. $25y^2 - 36x^2$

o. $x^2 - \frac{25}{81}$ (continue the pattern!!!)

p. $\frac{16}{25}x^2 - 9y^2$

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Answer Key

$a.(x+1)(x+6)$

$b.(x+4)(x+5)$

$c.(x+8)(x+9)$

$d.(x-3)^2$

$e.(x-3)(x-4)$

$f.(x-5)(x-10)$

$g.(x+3)(x-4)$

$h.(x+1)(x-1)$

$i.(x+4)(x-4)$

$j.(x+6)(x-6)$

$k.(x+6y)(x-6y)$

$l.(5+x)(5-x)$

$m.(5y+x)(5y-x)$

$n.(5y+6x)(5y-6x)$

$o.(x+\frac{5}{9})(x-\frac{5}{9})$

$p.(\frac{4}{5}x+3y)(\frac{4}{5}x-3y)$

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A Review of Factoring

Part Two: More Difficult Factoring

In this review we will focus on some of the more challenging types of factoring.

First we will discuss the situation where you need to combine factoring techniques. Factor the following, but watch out for how you might have to combine factoring techniques.

a. $4x^2 + 8x + 4$

b. $10x^2y + 20x^2yz - 2x^4y - 4x^4yz$

c. $5x^2 - 50$

d. $4x^2y - 4y$

e. $5x^2y + 25xy + 30y$

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Next we will focus on factoring harder trinomials via trial and error and also by grouping.

a. $2x^2 + 5x + 3$

b. $7x^2 + 15x + 2$

c. $5x^2 + 16x + 3$

d. $3x^2 + 8x + 5$

e. $15x^2 + 13x + 2$

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Finally we need to review the sum and difference of cubes. Write down the formulas for each.

Factor the following:

a. $x^3 + 8$

b. $x^3 - 125$

c. $8x^3 + 27$

d. $125x^3 - 27y^3$

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A Review of Factoring– More Practice!!!

Part Two: More Difficult Factoring

Factor the following.

a. $3x^2 + 10x + 3$

b. $4x^2 + 12x + 7$

c. $x^3 + 125$

d. $x^3 - 1$

e. $3x^2 - 12x + 14$

f. $5x^2 - 2x - 3$

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g. $27x^3 + 125y^3$

h. $9x^2 - 13x + 4$

i. $4x^2 + 25x + 6$

j. $4x^2 - 31x - 8$

k. $6x^2 + 19x - 20$

l. $14x^2 + 25x + 6$

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A Review of Polynomial Long Division

First we will look at how to divide a polynomial by a monomial.

a. $(x^4 + 7x^3 + 8x^2) \div x^2$

b. $(6x^2 + 15x - 10) \div 3x$

c. $\frac{\left(25x^6y^5 + 30x^4y^3 + 5x^3y^2\right)}{(5x^3y^2)}$

Now we will review how to divide using long division. Write down how to divide: $(x^2 + 6x + 5) \div (x + 5)$

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Let's try another example with $(4x^3 + 3x + 5) \div (2x - 3)$

Let's practice the following examples:

a. $(5x^3 - 13x^2 - 16x + 2) \div (5x + 2)$

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b. $(x^3 + 27) \div (x + 3)$

c. $(9x^3 + 17x - 14) \div (3x - 2)$

d. $(5x^2 + 28x + 9) \div (5x + 3)$

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A Review of Polynomial Long Division – *More Practice*

a. $(10x^5y^6 + 18x^4y^3 - 12x^6y^4) \div (2x^2y^3)$

b. $(3x^3 - 9x^2y + 6xy^2 - 12y^3) \div 3xy$

c. $(16x^2 - 88x + 121) \div (4x - 11)$

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d. $(49x^2 - 25) \div (7x - 5)$

e. $(12x^3 - 11x^2 + 17x - 10) \div (3x - 2)$

f. $(4x^2 + 6x - 3) \div (2x + 1)$

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Answer Key

a. $5x^3y^3 + 9x^2 - 6x^4y$

b. $\frac{x^2}{y} - 3x + 2y - \frac{4y^2}{x}$

c. $4x - 11$

d. $7x + 5$

e. $4x^2 - x + 5$

f. $2x + 2 - \frac{5}{2x+1}$

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A Review of Solving Quadratics

What are the four ways to solve a quadratic?

First let's take a look at how to solve using the square-root property. Solve $(x+2)^2 = 49$.

Solve $x^2 + 5x = -6$ by factoring.

Solve $x^2 + 4x + 6 = 0$ by completing the square.

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Solve $x^2 + 4x + 6 = 0$ by the quadratic formula.

Solve $2x^2 + 5x + 3 = 0$ by factoring.

Solve $2x^2 + 5x + 3 = 0$ by completing the square.

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Solve $2x^2 + 5x + 3 = 0$ by the quadratic formula.

Using each technique once for the following.

a. $x^2 + 7x + 12 = 0$

b. $x^2 + 8x + 1 = 0$

c. $(5x - 1)^2 = 64$

d. $2x^2 + x - 5 = 0$

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A Review of Solving Quadratics– *More Practice!!*

Solve the following quadratics using any techniques that you wish.

a. $x^2 = 10x + 75$

b. $x^2 - \frac{7}{20}x - \frac{3}{10} = 0$

c. $x^2 - 10x + 6 = 0$

d. $x^2 - 49 = 0$

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e. $x^2 - 2x - 1 = 0$

f. $(2x + 1)^2 = 25$

g. $x^2 + 12x = -33$

h. $x^2 = 7x + 2$

i. $3x^2 - 5x - 2 = 0$

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Answer Key

a. $x = 15, x = -5$

b. $x = \frac{3}{4}, x = -\frac{2}{5}$

c. $x = 5 + \sqrt{19}, x = 5 - \sqrt{19}$

d. $x = 7, x = -7$

e. $x = 1 + \sqrt{2}, x = 1 - \sqrt{2}$

f. $x = 2, x = -3$

g. $x = -6 + \sqrt{3}, x = -6 - \sqrt{3}$

h. $x = \frac{7}{2} + \frac{\sqrt{57}}{2}, x = \frac{7}{2} - \frac{\sqrt{57}}{2}$

i. $x = 2, x = -\frac{1}{3}$

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A Review of Absolute Value Equations and Inequalities

First we will discuss how to solve absolute value equations.

Show how to solve: $|5x + 4| = 24$

Show how to solve: $|1 - 3x| + 4 = 14$

Show how to solve: $|5x + 3| = |3x - 7|$

Show how to solve: $|4x + 2| + 8 = 5$

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What are the two possible cases for solving absolute value inequalities.

Show how to solve: $|3x - 6| \leq 12$

Show how to solve: $|4x + 2| > 10$

What is the difference between $|x + 4| < -5$ versus $|x + 4| > -5$?

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Solve the following:

a. $|4x - 8| < 12$

b. $|5x + 4| = |2x - 7|$

c. $4 < |x - 5|$

d. $|5x + 4| + 6 = 2$

e. $|5x - 2| \geq -4$

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A Review of Absolute Value Equations and Inequalities– *More Practice!!!*

a. $|2x - 4| = 12$

b. $|4x - 3| > 9$

c. $|5x + 10| + 6 = 16$

d. $|5x + 2| \leq 8$

e. $|7x + 3| + 6 < 2$

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f. $\left|\frac{2}{3}x - \frac{1}{2}\right| = \frac{5}{6}$

g. $|3x - 2| \geq 7$

h. $|4x - 6| > -6$

i. $|3x - 9| \geq 12$

j. $|5x + 4| + 3 < 22$

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Answer Key

$a. x = -4 \text{ or } x = 8$

$b. x < -\frac{3}{2} \text{ or } x > 3$

$c. x = -4 \text{ or } x = 0$

$d. -2 \leq x \leq \frac{6}{5}$

$e. \text{no solution}$

$f. x = -\frac{1}{2} \text{ or } x = 2$

$g. x \leq -\frac{5}{3} \text{ or } x \geq 3$

$h. \text{ true for all } x$

$i. x \leq -1 \text{ or } x \geq 7$

$j. -\frac{23}{5} < x < 3$

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A Review of Radicals

How do we determine what the square root(s) of 9 are?

What is the notation to represent only the positive square root?

How do we determine what the cube root(s) of 27 are?

What is the notation to represent any cube root?

Evaluate the following:

a. $\sqrt{25}$	c. $\sqrt[3]{27}$
b. $-\sqrt{16}$	d. $\sqrt[3]{-27}$

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Some radicals can be partially broken down. How would you evaluate the following:

a. $\sqrt{12}$

c. $\sqrt{50}$

b. $\sqrt[3]{24}$

d. $\sqrt[3]{-32}$

Now let's incorporate some variables into this. How would you evaluate the following:

a. $\sqrt{25x^6y^{10}z^4}$

c. $\sqrt{9x^2y^8z^4}$

b. $\sqrt[3]{8x^6y^{12}z^{24}}$

d. $\sqrt[3]{125x^6y^{15}z^3}$

Let's investigate the case when a variable cannot be fully broken down in the radical:

a. $\sqrt{x^7}$

c. $\sqrt[3]{x^8}$

b. $\sqrt{x^9y^{13}}$

d. $\sqrt[3]{x^{14}}$

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Finally let's put all of these ideas together.

a. $\sqrt{4x^6y^{10}}$

b. $\sqrt[3]{27x^6y^9z^{15}}$

c. $\sqrt{12x^6y^{10}}$

d. $\sqrt[3]{16x^6y^{12}}$

e. $\sqrt{50x^6y^7}$

f. $\sqrt[3]{250x^8y^{13}}$

g. $\sqrt{24x^7y^{11}}$

h. $\sqrt[3]{24x^7y^{11}}$

i. $\sqrt[4]{32x^7y^{12}z^{18}}$

j. $\sqrt[4]{16x^{10}y^{13}}$

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A Review of Radicals – ***More Practice, Harder Problems!***

a. $\sqrt{9x^6y^{10}}$

b. $\sqrt[3]{8x^6y^7}$

c. $\sqrt{75x^7y^8}$

d. $\sqrt[3]{24x^8y^{14}}$

e. $\sqrt[4]{32x^6y^8z^{13}}$

f. $\sqrt{32x^6y^8z^{13}}$

g. $\sqrt[3]{32x^6y^8z^{13}}$

h. $\sqrt[3]{-8x^8y^{14}}$

i. $\sqrt{16x^7y^{13}}$

j. $\sqrt[4]{16x^8y^{12}z^{16}}$

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Answer key:

$a. 3x^3y^5$

$b. 2x^2y^2\sqrt[3]{y}$

$c. 5x^3y^4\sqrt{3x}$

$d. 2x^2y^4\sqrt[3]{3x^2y^2}$

$e. 2xy^2z^3\sqrt[4]{2x^2z}$

$f. 4x^3y^4z^6\sqrt{2z}$

$g. 2x^2y^2z^4\sqrt[3]{4y^2z}$

$h. -2x^2y^4\sqrt[3]{x^2y^2}$

$i. 4x^3y^6\sqrt{xy}$

$j. 2x^2y^3z^4$c

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A Review of Radicals– ***More Practice, Basic Problems!***

a. $\sqrt{4}$	j. $\sqrt{12}$
b. $\sqrt[3]{8}$	k. $\sqrt{32}$
c. $\sqrt{16}$	l. $\sqrt[3]{18}$
d. $\sqrt[4]{16}$	m. $\sqrt[4]{32}$
e. $\sqrt[3]{125}$	n. $\sqrt{75}$
f. $\sqrt{81x^4}$	o. $\sqrt[3]{250}$
g. $\sqrt[4]{81x^4}$	p. $\sqrt{500x^6}$
h. $\sqrt[4]{-16}$	q. $\sqrt[4]{-32}$
i. $\sqrt[3]{-1}$	r. $\sqrt[3]{-375x^9y^6}$

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Answer key

a. 2

b. 2

c. 4

d. 2

e. 5

f. $9x^2$

g. 3x

h. does not exist

i. -1

j. $2\sqrt{3}$

k. $4\sqrt{2}$

l. can't be simplified more

m. $2\sqrt[4]{2}$

n. $5\sqrt{3}$

o. $5\sqrt[3]{2}$

p. $10x^3\sqrt{5}$

q. does not exist

r. $-5x^3y^2\sqrt[3]{3}$

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A Review of Radical Operations

Which of the following are like radicals and like terms?

$\sqrt{5}$ $6\sqrt[3]{7}$ $-2\sqrt{3}$ $6\sqrt{5}$ $7\sqrt[3]{5}$ $\sqrt{3}$

$4x\sqrt{5}$ $3\sqrt[3]{5}$ $-2\sqrt[3]{7}$ $2x\sqrt[3]{5}$ $x\sqrt{5}$ $2x\sqrt[3]{5}$

Only like terms and like radicals can be added or subtracted. Complete the following operations

a. $4\sqrt{5} - 3\sqrt[3]{5} + 7\sqrt{5} + 2x\sqrt[3]{5}$

b. $\sqrt{24} + 5\sqrt{6} - 2\sqrt{3}$

c. $2\sqrt{8x} - 5\sqrt{2x}$

d. $7\sqrt[3]{81x^5} + 2x\sqrt[3]{3x^2}$

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What is the rule for multiply radicals?

Multiply the following:

a. $\sqrt{5}(\sqrt{2}-5\sqrt{7})$

b. $\sqrt{5}(\sqrt{10}-2\sqrt{15})$

c. $(\sqrt{2}+\sqrt{3})(\sqrt{5}+\sqrt{7})$

d. $(\sqrt{2}+\sqrt{5})(\sqrt{10}+3\sqrt{6})$

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How can you multiply an expression like $\left(\sqrt{3}-\sqrt{5}\right)^2$?

Multiply the following:

a. $\left(\sqrt{3}+\sqrt{6}\right)^2$

b. $\left(2\sqrt{5}+\sqrt{10}\right)^2$

c. $\left(4\sqrt{6}-2\sqrt{10}\right)^2$

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When a fraction has a single square root in the denominator, you can multiply the top and bottom by that denominator. Simplify the following:

a. $\frac{4}{\sqrt{5}}$	b. $\frac{\sqrt{3}}{\sqrt{5}}$
c. $\sqrt{\frac{7}{10}}$	d. $\frac{2\sqrt{5}}{\sqrt{6}}$

When a fraction has a radical expression in the denominator, you multiply the numerator and denominator by the conjugate. What is the conjugate of the following?

a. $4+\sqrt{3}$	b. $\sqrt{2}-\sqrt{6}$
c. $-\sqrt{5}-\sqrt{7}$	d. $\sqrt{7}-2$

Show how to simplify: $\frac{5}{\sqrt{2}+3}$

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Simplify the following:

a. $\frac{6}{\sqrt{5}-\sqrt{2}}$

b. $\frac{\sqrt{3}}{\sqrt{6}+\sqrt{2}}$

c. $\frac{\sqrt{5}+\sqrt{6}}{\sqrt{2}+\sqrt{5}}$

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A Review of Radical Operations – *More Practice!!!!*

Complete the following operations.

a. $7\sqrt[3]{4} - 2\sqrt{2} + 3\sqrt[3]{4} + 7\sqrt{2}$

b. $8x^4\sqrt[3]{x} - 3\sqrt[3]{x^{13}}$

c. $\sqrt{45} + 7\sqrt{5}$

d. $6x\sqrt{x} - 4\sqrt{x^3}$

e. $12xy\sqrt[4]{9xy} - 5\sqrt[4]{9x^5y^5}$

f. $\sqrt{xy^3} - 3y\sqrt{xy}$

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Complete the following operations.

a. $\sqrt{5x}\left(\sqrt{3}-\sqrt{x}\right)$

b. $\sqrt{xy}\left(\sqrt{7x}+\sqrt{y}\right)$

c. $\sqrt[3]{x^2}\left(\sqrt[3]{x^2}-\sqrt[3]{27xy}\right)$

d. $(3\sqrt{2}-5\sqrt{5})(7\left(\sqrt{2}+\sqrt{3}\right)$

e. $(\sqrt[3]{25}-2)(\sqrt[3]{5}+\sqrt[3]{3}$

f. $\left(\sqrt{5x}-\sqrt{5}\right)^2$

g. $\left(2\sqrt{6}-\sqrt{3}\right)^2$

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Simplify the following fractions.

a. $\frac{6}{\sqrt{2}}$

b. $\frac{\sqrt{5}}{\sqrt{10}}$

c. $\frac{\sqrt{14}}{\sqrt{6}}$

d. $\frac{3}{\sqrt{3}-\sqrt{6}}$

e. $\frac{5\sqrt{2}}{\sqrt{2}-\sqrt{5}}$

f. $\frac{2+\sqrt{3}}{\sqrt{6}+\sqrt{3}}$

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Answer Key

Page 1:

a. $10\sqrt[3]{4} + 5\sqrt{2}$

b. $5x^4\sqrt[3]{x}$

c. $10\sqrt{5}$

d. $2x\sqrt{x}$

e. $7xy\sqrt[4]{9xy}$

f. $-2y\sqrt{xy}$

Page 2:

a. $\sqrt{15x} - x\sqrt{5}$

b. $x\sqrt{7y} + y\sqrt{x}$

c. $x\sqrt[3]{x} - 3x\sqrt[3]{y}$

d. $42 + 3\sqrt{6} - 35\sqrt{10} - 5\sqrt{15}$

e. $5 + \sqrt[3]{75} - 2\sqrt[3]{5} - 2\sqrt[3]{3}$

f. $5x - 10\sqrt{x} + 5$

g. $27 - 12\sqrt{2}$

section 3

a. $3\sqrt{2}$

b. $\frac{\sqrt{2}}{2}$

c. $\frac{\sqrt{21}}{3}$

d. $-\sqrt{3} - \sqrt{6}$

e. $\frac{10+5\sqrt{10}}{-3}$

f. $\frac{2\sqrt{6}-2\sqrt{3}+3\sqrt{2}-3}{3}$

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A Review of Rational Exponents

How do we interpret a rational exponent like: $x^{\frac{a}{b}}$?

Evaluate the following:

a. $9^{\frac{1}{2}}$	e. $25^{-\frac{3}{2}}$
b. $8^{\frac{1}{3}}$	f. $(-8)^{\frac{2}{3}}$
c. $8^{-\frac{1}{3}}$	g. $(-8)^{\frac{5}{3}}$
d. $8^{\frac{2}{3}}$	h. $\left(\frac{9}{4}\right)^{-\frac{3}{2}}$

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Now use the rational exponent rules to simplify the following. Your final answer should not include negative exponents.

a. $x^{\frac{2}{3}}y^{\frac{1}{5}} * x^{\frac{2}{3}}y^{\frac{2}{5}}$

b. $\left(x^{\frac{1}{4}}y^{\frac{2}{5}}\right)^{10}$

c. $(8x^3y^6)^{\frac{2}{3}}$

d. $\left(25x^4y^{\frac{1}{3}}\right)^{-\frac{3}{2}}$

e. $x^{-\frac{1}{3}}y^{\frac{2}{7}} * x^{\frac{1}{4}}y^{-\frac{3}{7}}$

f. $\frac{15x^{\frac{2}{3}}y^{-\frac{1}{5}}}{10x^{\frac{1}{6}}y^3}$

g. $\left(4x^{\frac{1}{2}}y^6\right)^{\frac{5}{2}}$

h. $\frac{4x^2y^{\frac{2}{3}}}{6x^{\frac{1}{5}}y^{\frac{1}{2}}}$

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A Review of Rational Exponents– *More Practice!!!*

a. $25^{\frac{3}{2}}$

b. $8^{\frac{4}{3}}$

c. $16^{-\frac{1}{4}}$

d. $4^{\frac{5}{2}}$

e. $\left(\frac{4}{9}\right)^{-\frac{3}{2}}$

f. $x^{\frac{1}{6}}y^{\frac{2}{5}} * xy^{\frac{1}{3}}$

g. $\left(-8x^{6}y^{\frac{1}{3}}\right)^{\frac{2}{3}}$

h. $\left(\frac{4x^{6}y^{\frac{1}{2}}}{z^{6}}\right)^{-\frac{3}{2}}$

i. $\left(-\frac{27x^{3}y^{5}}{z^{\frac{1}{3}}}\right)^{\frac{2}{3}}$

j. $\left(4x^{\frac{1}{3}}y^{\frac{2}{5}}\right)^{-\frac{3}{2}}$

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Answer Key

$a.125, b.16, c.\frac{1}{2}, d.32\ , e.\frac{27}{8}, f.x^{7/6}y^{11/15}, g.4x^4y^{2/9}, h.\frac{z^9}{8x^9y^{3/4}}\ , i.\frac{9x^2y^{10/3}}{z^{2/9}}, j, .\frac{1}{8x^{1/2}y^{3/5}}$

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A Review of Functions

What is the definition of a function?

What is the notation for a function?

Let $f(x) = x^2 - 3x + 1$ and $g(x) = 4x + 5$. Evaluate the following:

a. $f(-2)$

b. $g(5)$

c. $g(a - 4)$

d. $f(x + h)$

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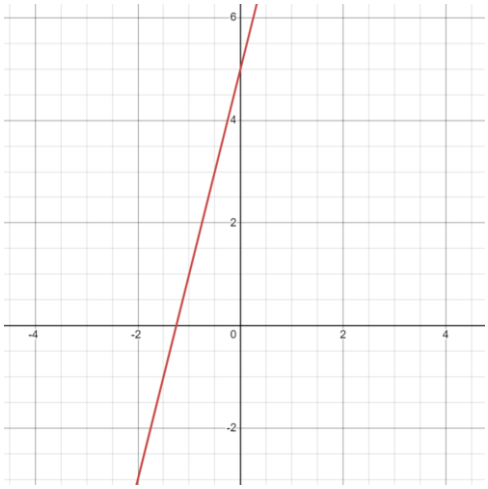
What is the domain?

What is the range?

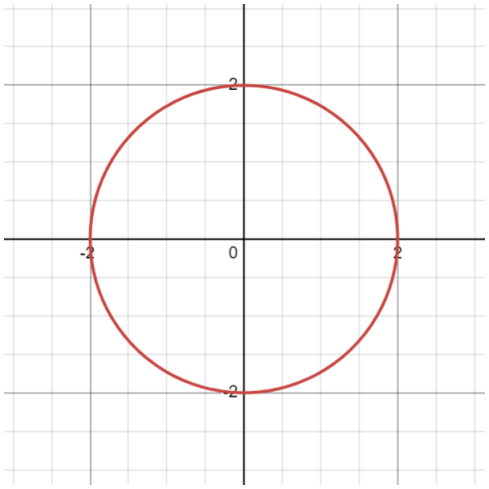
Explain the relationship between a domain and range for a function:

One easy way to determine if an equation is a function is with the vertical line test. Use the vertical line test to determine if the following are functions. (Graphs provided by desmos.com)

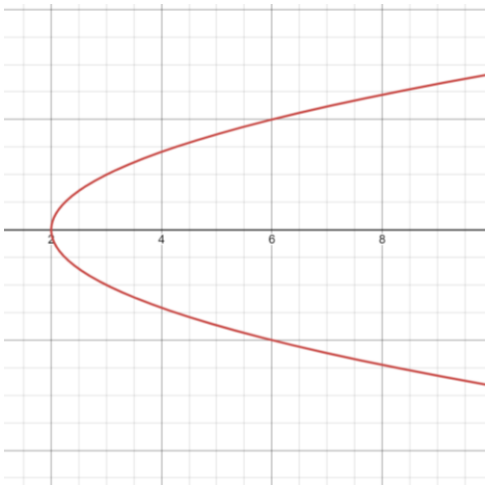
a.



b.



c.



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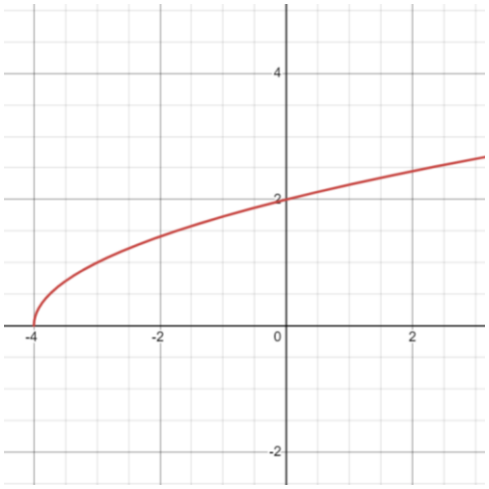

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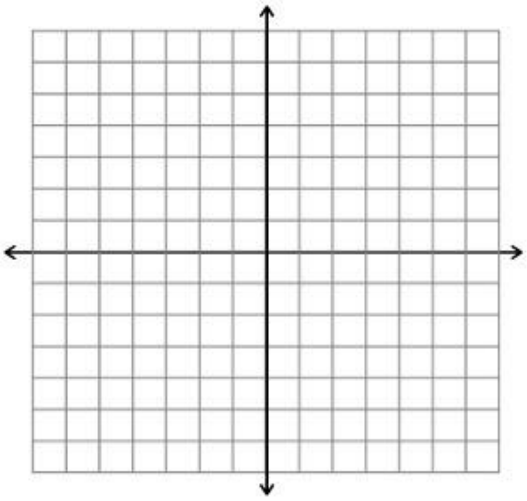
Show how to graph $f(x) = 4x - 1$



Next we will discuss different operations with functions.

Let $f(x) = 5x - 2, g(x) = x - 2, h(x) = x^2 - 4$. Find the value of the following.

a. $(f + g)(x)$

b. $(f * h)(x)$

c. $(f + g)(3)$

d. $(f - g)(-2)$

e. $\left(\frac{h}{g}\right)(x)$

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We also need to discuss the composition of functions. What does $(f \circ g)(x)$ mean?

Let $f(x) = 5x - 2, g(x) = x - 2, h(x) = x^2 - 4$. Find the value of the following.

a. $(f \circ g)(x)$

b. $(h \circ f)(x)$

c. $(g \circ f)(x)$

d. $(g \circ h)(3)$

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A Review of Functions– *More Practice!!!*

Let $f(x) = 4x + 3, g(x) = x + 3, h(x) = x^2 + 5x + 6, k(x) = x^2 - 9$. Determine the value of the following functions.

a. $f(6)$

b. $h(-1)$

c. $(g + h)(x)$

d. $\left(\frac{h}{g}\right)(x)$

e. $(k \circ f)(x)$

f. $(h * f)(3)$

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Let $f(x) = 4x + 3, g(x) = x + 3, h(x) = x^2 + 5x + 6, k(x) = x^2 - 9$. Determine the value of the following functions.

g. $f(t + 3)$

h. $k(x + h)$

i. $k(2)$

j. $\left(\frac{h}{k}\right)(2)$

k. $(g - h)(-2)$

l. $(g \circ f)(2)$

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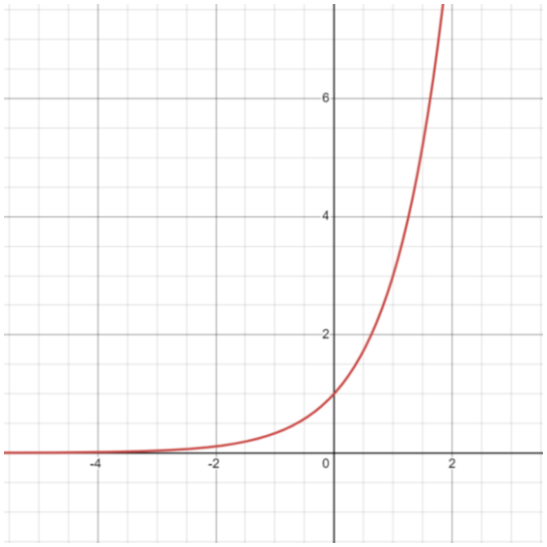
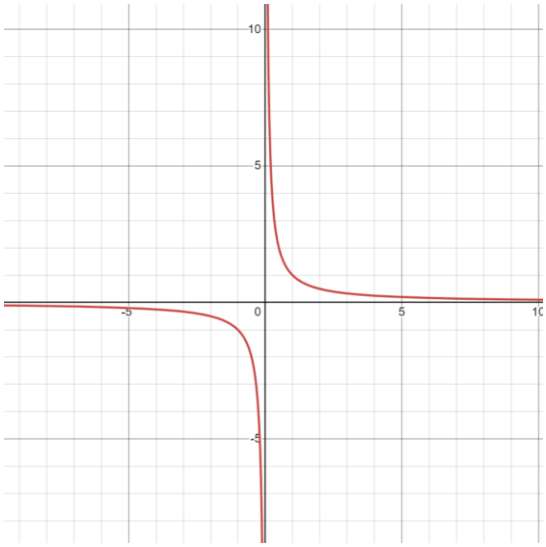
Determine if the following are functions by using the vertical line test.

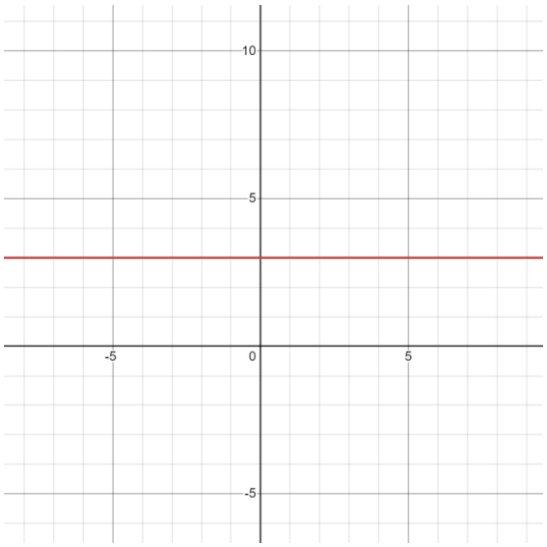
a.



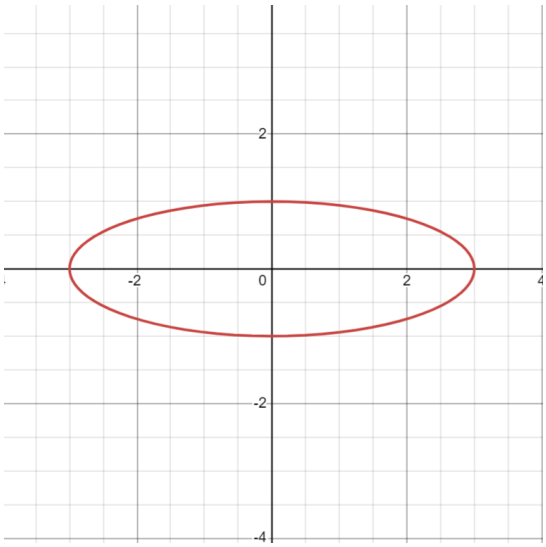
b.



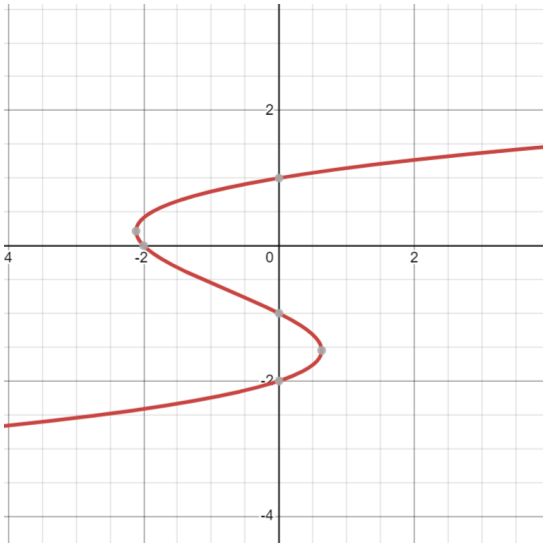
c.



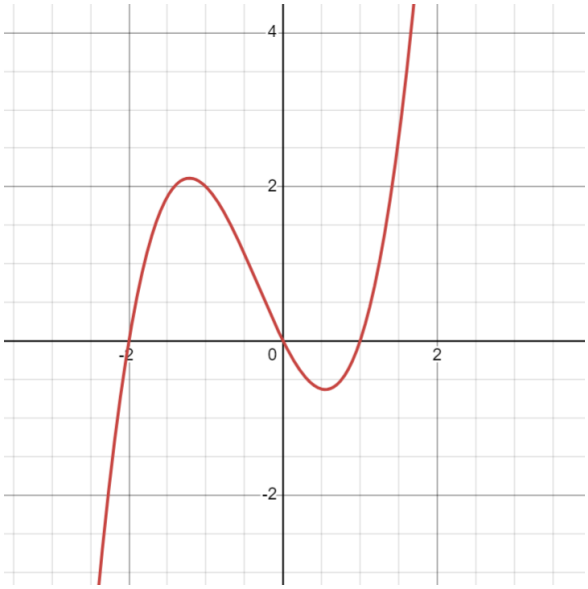
d.



e.



f.



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Answer Key

Functions

a. 27

b. 2

c. $x^2 + 6x + 9$

d. $x + 2$

e. $16x^2 + 24x$

f. 450

g. $4t + 15$

h. $x^2 + 2xh + h^2 - 9$

i. -5

j. -4

k. 1

l. 14

Graph Section:

a. yes it's a function

b. yes it's a function

c. yes it's a function

d. no it's not a function

e. no it's not a function

f. yes it's a function

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A Review of Inverse Functions

What is the definition of an inverse function?

Only one-to-one functions have inverses. What are one-to-one functions?

How can you visualize the relationship between the domain and range for a one-to-one function?

One way to determine a one-to-one function is with the horizontal line test. Describe what that is.

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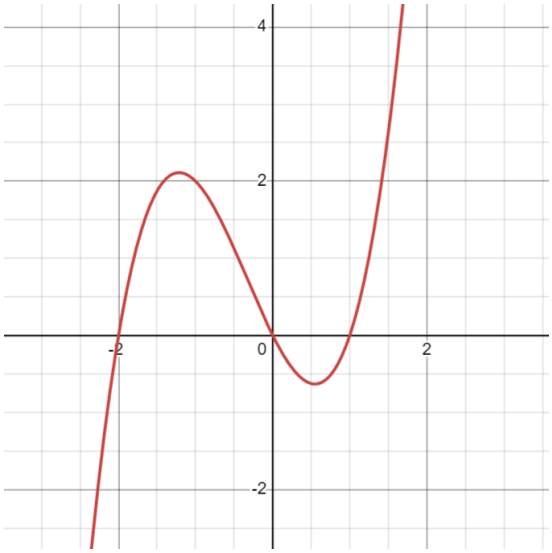
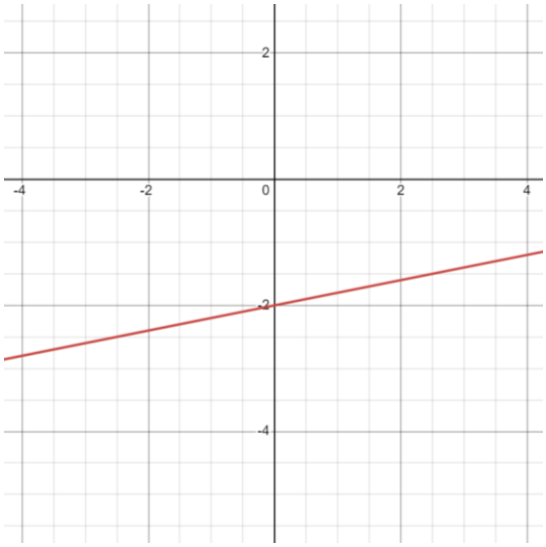
Which of the following are both functions and one-to-one functions? (Graphs provided by Desmos.com)

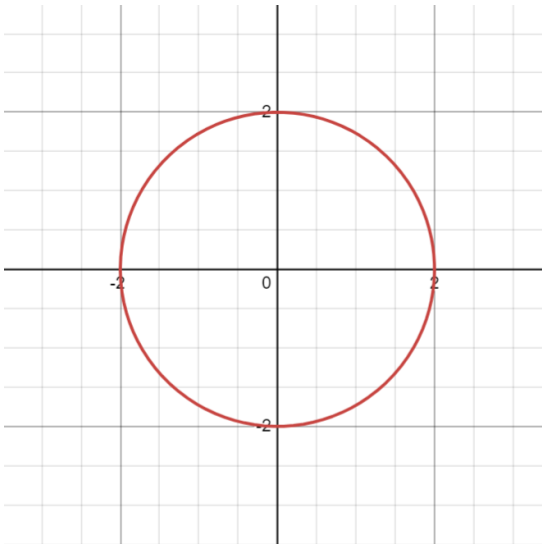
a.



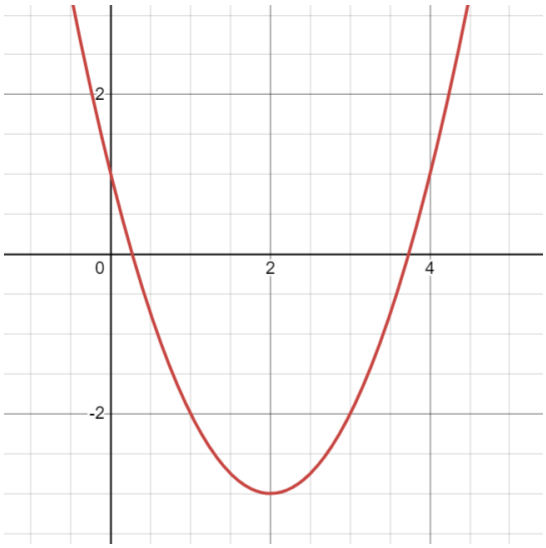
b.



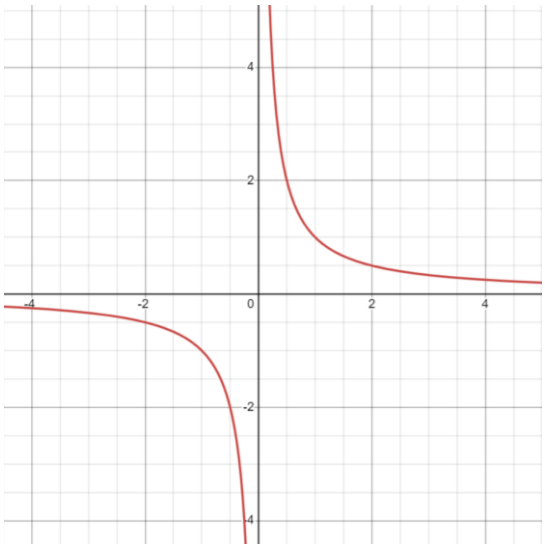
c.



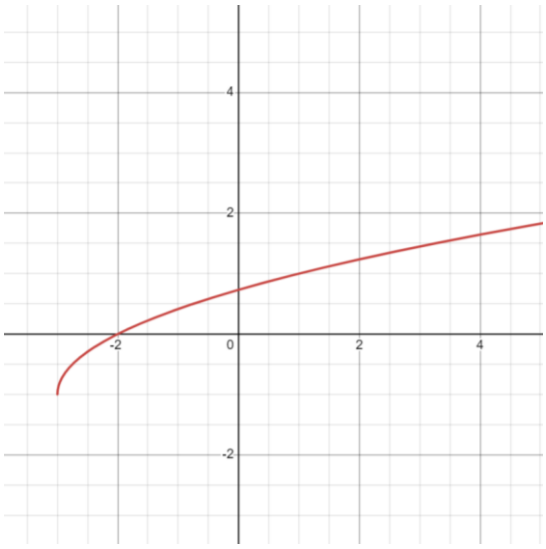
d.



e.



f.



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Which is the following functions defined only by the set of points have inverses? What is the inverse?

a. $\{ (3,4), (7,2), (-2,5)\}$

b. $\{(4,-2), (-1,-3), (7,-2)\}$

c. $\{(5,2), (6,3), (5,7)\}$

Explain how to find the inverse of a function using the function $f(x) = 3x - 2$

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Find the inverse of the following functions.

a. $f(x) = 4x - 2$

b. $g(x) = x^3$

c. $f(x) = -\frac{5}{x-2}$

d. $g(x) = \sqrt{x} + 2$

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A Review of Inverse Functions– ***More Practice!!!!***

Determine if the following sets of points define a function and/or a one-to-one function.

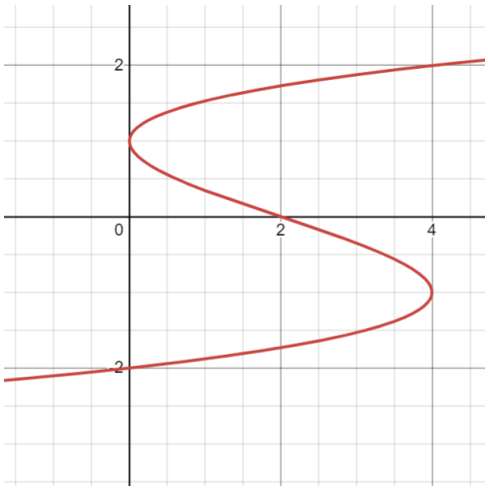
a. $\{(4,5),(-2,5),(3,4)\}$

b. $\{(-2,-3),(-4,3),(-2,5)\}$

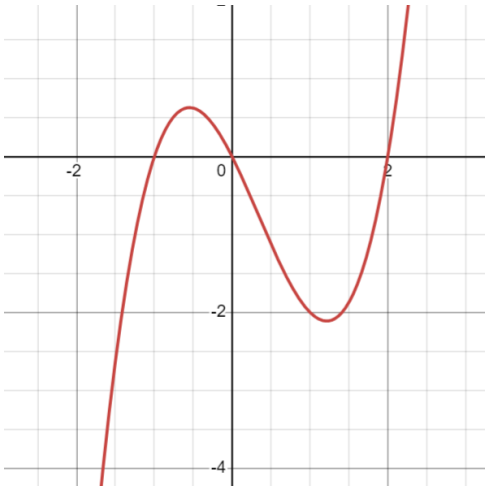
c. $\{(3,5),(2,7),(4,5)\}$

Do the following graphs represent a function and/or a one-to-one function?

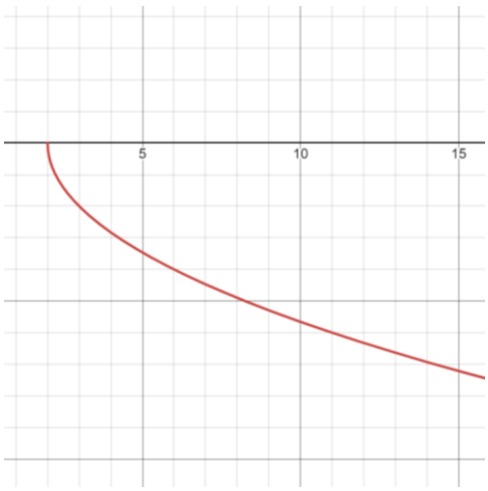
a.



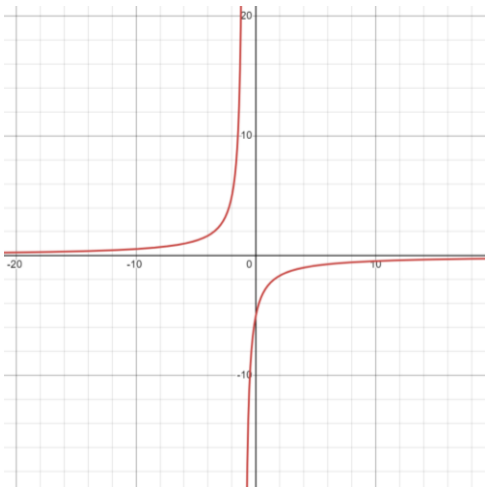
b.



c.



d.



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Determine the inverse of the following functions.

a. $f(x) = 4x - 6$

b. $g(x) = \frac{1}{x} + 3$

c. $f(x) = \sqrt{x} + 4$

d. $g(x) = \frac{6}{x+2}$

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Answer Key

Page 1, Section 1:

a. it's a function but not one-to-one

b. it's not a function

c. it's a function but not one-to-one

Page 1, Section 2:

a. Not a function

b. A function but not one-to-one

c. It is a one-to-one function

d. It is a one-to-one function

Page 2:

a. $f^{-1}(x) = \frac{1}{4}x + \frac{3}{2}$

b. $g^{-1}(x) = \frac{1}{x-3}$

c. $f^{-1}(x) = (x-4)^2, x \geq 4$

d. $g^{-1}(x) = \frac{6}{x} - 2$

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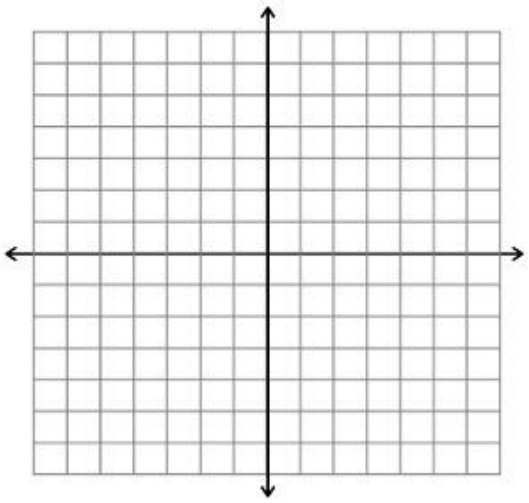
A Review of Exponentials

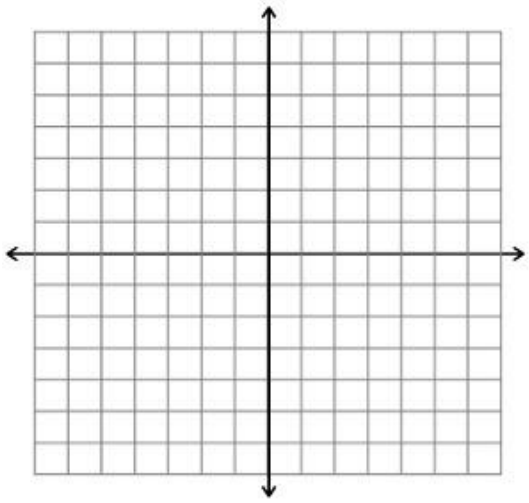
What form does an exponential equation have?

Graph the following exponentials.

a. $y = 2^x$



b. $y = \left(\frac{1}{2}\right)^x$



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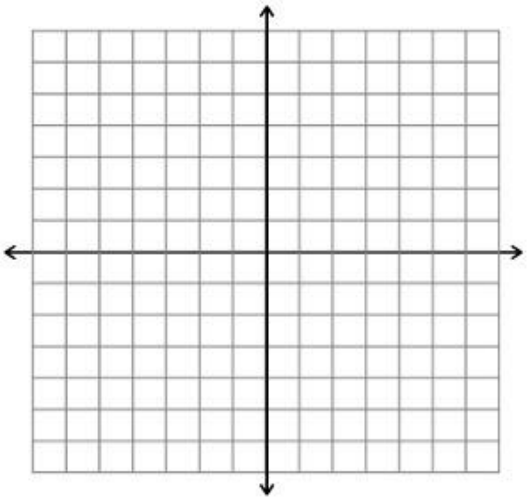
One of the well known exponential is $y = e^x$. Explain what the graph of this function looks like.



Now we will review how to solve exponential equations. Solve the following.

a. $2^x = 8$

b. $2^{4x} = 8$

c. $8^{4x} = 4^{3x+2}$

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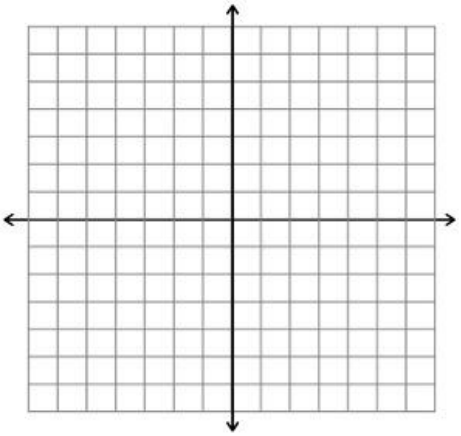
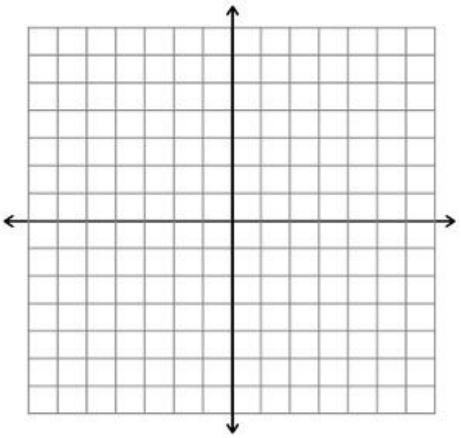
A Review of Exponentials– *More Practice!!!*

Graph the following.

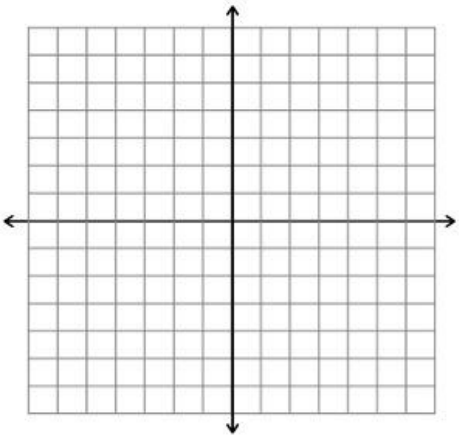
a. $f(x) = 3^x$



b. $g(x) = \left(\frac{1}{4}\right)^x$



c. $f(x) = \left(\frac{1}{3}\right)^x$



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Solve the following equations.

a. $4^x = 16$

b. $5^x = \frac{1}{125}$

c. $2^{3x} = 16^{x-2}$

d. $25^{4x} = 125^{2x-4}$

e. $\left(\frac{1}{8}\right)^{2x} = 16^{3x+2}$

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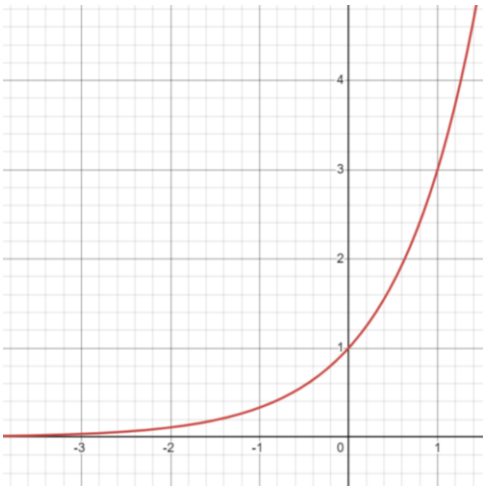
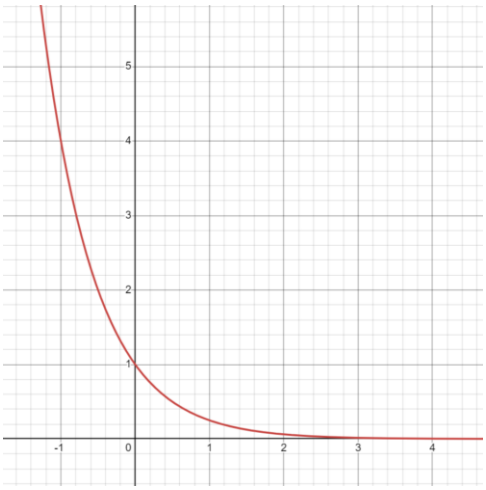
Answer Key

Graphing Section

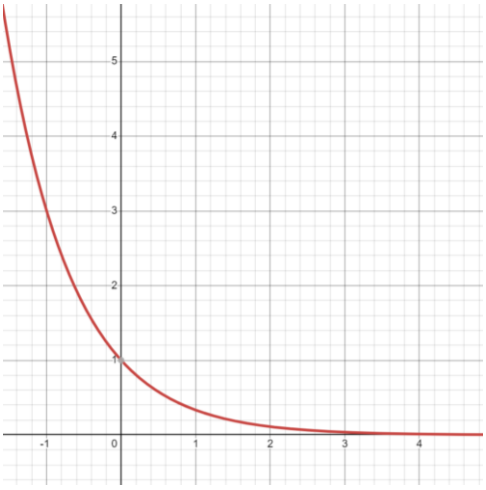
a.



b.



c.



Equations Section:

$a. x = 2 \quad b. x = -3 \quad c. x = 8 \quad d. x = -6 \quad e. x = -\frac{4}{9}$

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A Review of Logarithms

What is the definition of a logarithm?

What is the inverse of a logarithm?

Rewrite the following in logarithmic form:

a. $16 = 4^2$	b. $\left(\frac{1}{9}\right) = 3^{-2}$
c. $5^0 = 1$	d. $y = 6^x$

Rewrite the following in exponential form:

a. $\log_2 8 = 3$	b. $\log_2 32 = 5$
c. $\log_3 \frac{1}{3} = -1$	d. $\log_3 1 = 0$

What are the most common logarithms?

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Evaluate the following logarithms:

a. $\ln e$

b. $\log 1$

c. $\log_3 9$

There are a few key properties of logarithms. What are they?

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Expand the following logarithms.

a. $\log_3 xyz$

b. $\log \frac{x^2}{y}$

c. $\ln \frac{x^5 y^2}{z^3}$

d. $\log_3 3\sqrt{x}$

Rewrite the following as a single logarithm.

a. $\log x - \log y - 4 \log z$

b. $\ln x + 5 \ln y - \frac{1}{2} \ln z$

c. $5 \log x + 2 \log 3 - 2 \log x$

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A Review of Logarithms– ***More Practice!!!***

Evaluate the following logarithms.

a. $\log_2 \frac{1}{4}$

b. $\ln 1$

c. $\log_5 5$

d. $\log_3 27$

Rewrite in logarithmic form:

a. $5^{-2} = \frac{1}{25}$

b. $3^3 = 27$

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Expand the following logarithms.

a. $\log_3 \frac{7x}{y}$

b. $\ln 4x^6y$

c. $\log_5 \frac{5x^5}{y^6z^7}$

d. $\ln \sqrt{3x^5y^4}$

e. $\log \frac{\sqrt{6x}}{y^7z^5}$

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Rewrite as a single logarithm.

a. $5 \ln x - 3 \ln y$

b. $\log ab - \log c - 4 \log b$

c. $\frac{1}{2} \ln x - \frac{1}{2} \ln y$

d. $5 \log x + 7 \log y - 2 \log x - 9 \log z$

e. $\log ab - \log bc + \log cd$

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Answer Key

Page 1, Section 1

a. -2 b. 0 c. 1 d. 3

Page 1, Section 2:

a. $\log_5\left(\frac{1}{25}\right) = -2$

b. $\log_3(27) = 3$

Page 2:

a. $\log_3 7 + \log_3 x - \log_3 y$

b. $\ln 4 + 6\ln x + \ln y$

c. $1 + 5\log_5 x - 6\log_5 y - 7\log_5 z$

d. $\frac{1}{2}(\ln 3 + 5\ln x + 4\ln y)$

e. $\frac{1}{2}(\log 6 + \log x) - 7\log y - 5\log z$

Page 3:

a. $\ln\frac{x^5}{y^3}$

b. $\log\frac{a}{b^3c}$

c. $\ln\sqrt{\frac{x}{y}}$

d. $\log\frac{x^3y^7}{z^9}$

e. $\log(ad)$

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