



The Kinkaid School

Math Summer Review Packet

in preparation for

Algebra II Honors

Welcome future Kinkaid Algebra II students!

This summer review packet has been developed to help you be successful this year in Algebra II Honors. The packet focuses on the algebraic concepts and skills from Algebra I that are prerequisite for the study of advanced algebra.

You are responsible for knowing not just the “how” but also the “why” for all questions in this packet. Although you will not need to turn in your work on the packet, **there will be a quiz over the material in the review packet during the 2nd week of school.** Material from the packet will also be included on tests throughout the year. You will have opportunities during the first week of school to obtain assistance from your teacher on any concepts from the packet with which you have difficulty.

We look forward to seeing you in August!

Sincerely,

The Kinkaid Algebra II Team

PART I: NUMBERS AND OPERATIONS

Concepts you must know:

- subsets of real numbers: natural numbers, integers, rational and irrational numbers
- order of operations (PEMDAS)
- reducing, adding, subtracting, multiplying, and dividing fractions
- division by zero is undefined

1. Each number below belongs to one or more of the following sets: the ***natural numbers***, ***integers***, ***rational numbers***, and ***irrational numbers***. List all of the sets to which each number belongs.

a. -29

b. $\sqrt{3}$

c. $\frac{8}{3}$

d. π

e. 17

f. 3.084

2. Which of the following is equal to zero, and which is undefined? Why?

a. $\frac{0}{12}$

b. $\frac{12}{0}$

3. Which of the following is positive, and which is negative? Why?

a. -5^2

b. $(-5)^2$

4. Use the correct order of operations to simplify the following expressions by hand. If your answer is a fraction, reduce it fully.

a. $-3^2 + 20 - 2 \times 3$

b. $(2 + 3)^2 - 2 + 12 \div 2^2$

c. $(-6)^2 \div 2^2 - 2(3)^2$

d. $\sqrt{3^2 + 4^2}$

e. $\frac{7}{8} - \frac{5}{12} + \left(\frac{1}{2}\right)^2$

f. $2 \times \frac{2}{3} + \frac{1}{3} \div 2$

g. $3 \div \frac{2}{3} - 5 \times \frac{1}{4}$

h. $\frac{5}{6} \div \frac{1}{2} - \frac{4}{27} \times \left(\frac{3}{2}\right)^2$

i. $\frac{\frac{15}{8}}{\frac{5}{2}}$

j. $\frac{\frac{2}{3}}{2} + \frac{2}{\frac{2}{3}}$

PART II: LAWS OF EXPONENTS

Concepts you must know:

- | | |
|---|--|
| <ul style="list-style-type: none">• $a^0 = 1$• $a^n \cdot a^m = a^{n+m}$• $a^n \div a^m = a^{n-m}$ | <ul style="list-style-type: none">• $(a^n)^m = a^{nm}$• $a^{-n} = 1/a^n$• $(a + b)^n \neq a^n + b^n$ (Exponents do NOT distribute!) |
|---|--|

Simplify each expression, eliminating all negative exponents and reducing all fractions.

1. x^5x^3

2. $\frac{x^5}{x^3}$

3. $(x^5)^3$

4. $\frac{x^3}{x^5}$

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

6. $(2xy^2)^0$

7. $-2^3(2xy^2)^2$

8. $3x^{-2}$

9. $\frac{1}{15x^{-3}}$

10. $(15x^0y^2z^{34})(3x^{16}y^{-29}z^0)$

11. $\frac{9x^6y^{-3}}{12x^{-2}y^4}$

12. $\left(\frac{-2a^2b^3c^0}{3a^3b^3c^7}\right)^{-2}$

PART III: POLYNOMIAL OPERATIONS

Concepts you must know:	
- combining like terms - distributing negatives when appropriate	- FOIL and how to square a binomial - multiplying one polynomial by another

Perform the indicated operation, combine like terms, and simplify as much as possible.

1. $(3x - 5) + (6x - 4)$

2. $\frac{2t}{3}(12t^2 + 15)$

3. $(y - 3)^2$

4. $(10 - 3p)(3p + 10)$

5. $(gh^2 - 4gh) - (2gh + 3gh^2) - (2 - 5gh)$

6. $(5x - 3y)(5x + 3y)$

7. $(4xy - 2y + 3x) + (3xy - 6y + 6x)$

8. $(2m - 3n)^2$

9. $(4c^2 - 8cd - 6c) + 2(5 + 2c^2 - 5cd)$

10. $(5c^2 + r) - 3(7c - 4 + c^2)$

11. $(6x^2 - x^3) + 2(x - 2x^2) - 3(7x - 2x^3)$

12. $2t(t + 3)(t^2 - 4t + 5)$

PART IV: LINEAR EQUATIONS

Concepts you must know:	
• the golden rule of algebra • isolating a variable • eliminating fractions	• checking your answer (by plugging it back in) • solving systems by substitution • solving systems by elimination

Solve each equation by hand. If there is no solution or the solution is all real numbers, explain why.

1. $4x - 1 = \frac{x}{3}$

2. $\frac{x-3}{2} + 5 = 1$

3. $\frac{1}{2}(2 - 4x) + 2x = 13$

4. $d + \frac{d+7}{8} - \frac{5d}{6} = -\frac{1}{12}$

5. $-5(4u - 2) = -2(3 + 6u)$

6. $\frac{3}{2}(2x + 6) = 3x + 9$

7. $12 + 2n - n = 9n - 4$

8. $\frac{4}{9}t - 12 = \frac{1}{6}(t - 12) - 3$

Solve each system of equations using the indicated method. Express your answer as an ordered pair.

9. Solve by substitution:

$$\begin{cases} y = 2x - 1 \\ 5x + 2y = 34 \end{cases}$$

10. Solve by substitution:

$$\begin{cases} x - 3y = -2 \\ 3x + 2y = 27 \end{cases}$$

11. Solve by elimination:

$$\begin{cases} 2x - 5y = -13 \\ -x + 7y = 11 \end{cases}$$

12. Solve by elimination:

$$\begin{cases} 3x + 2y = 23 \\ 2x + 3y = 22 \end{cases}$$

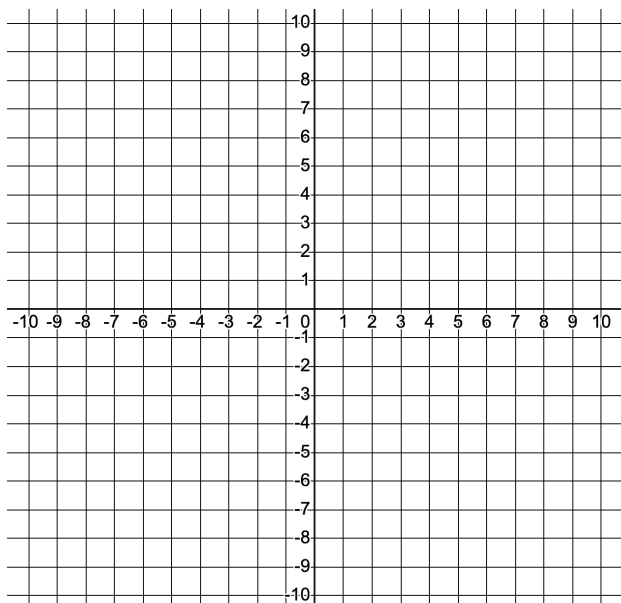
PART V: LINEAR FUNCTIONS

Concepts you must know:

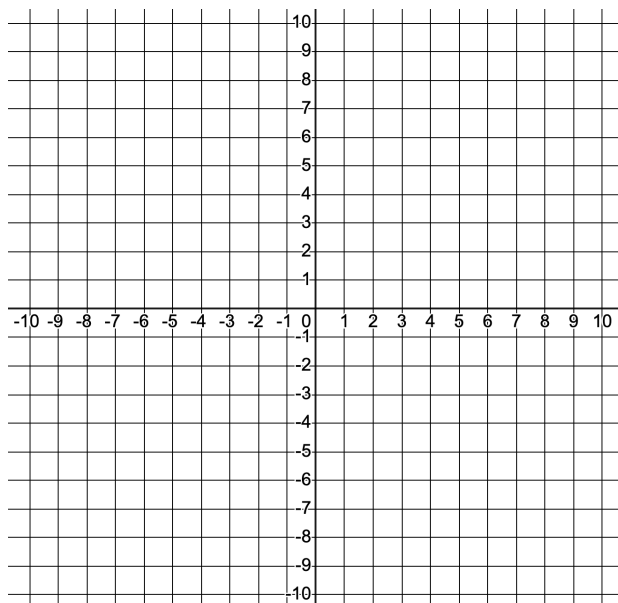
- slope-intercept form
- finding an equation from a graph
- equations for horizontal and vertical lines
- parallel and perpendicular lines

1. Graph the line represented by each equation on the axes provided.

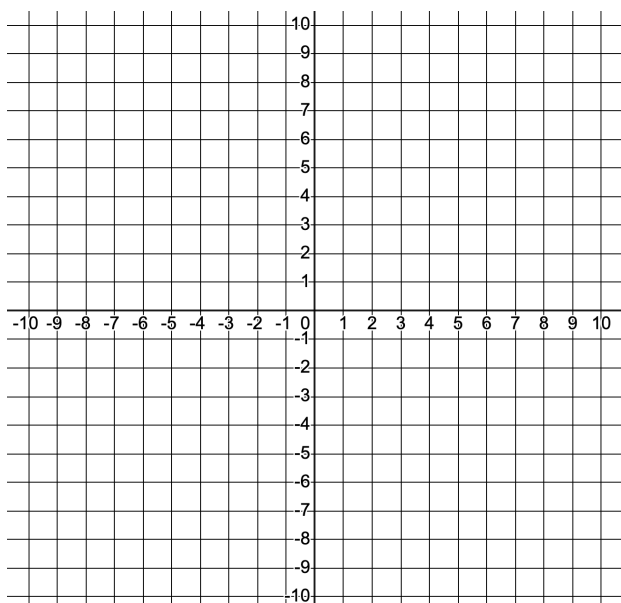
a. $y = \frac{1}{2}x - 3$



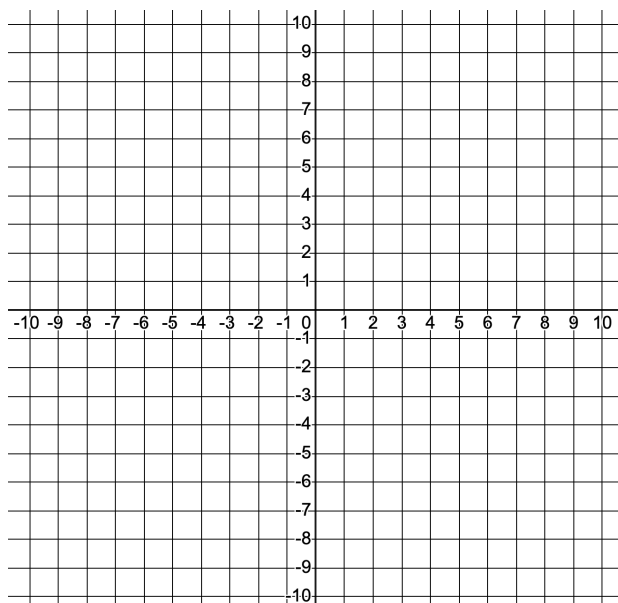
b. $y = -4$



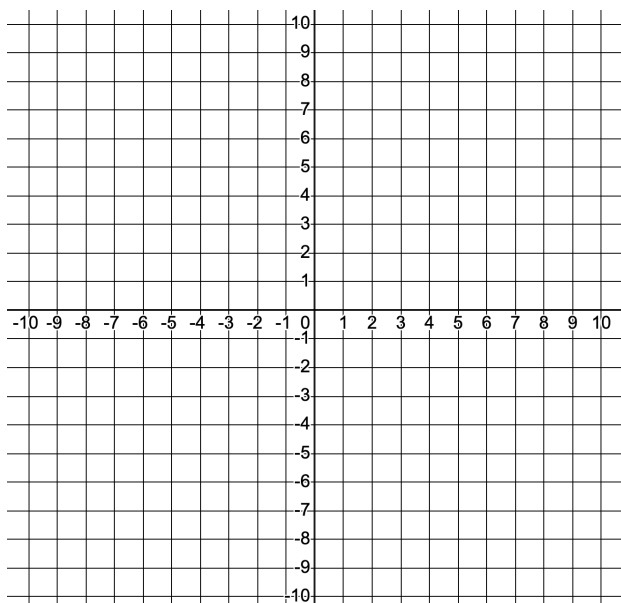
c. $x - y = 5$



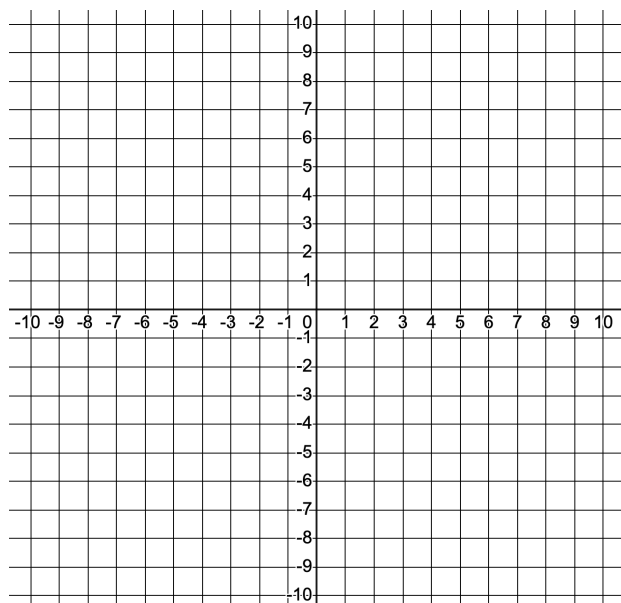
d. $x = 3$



e. $y = 3x$

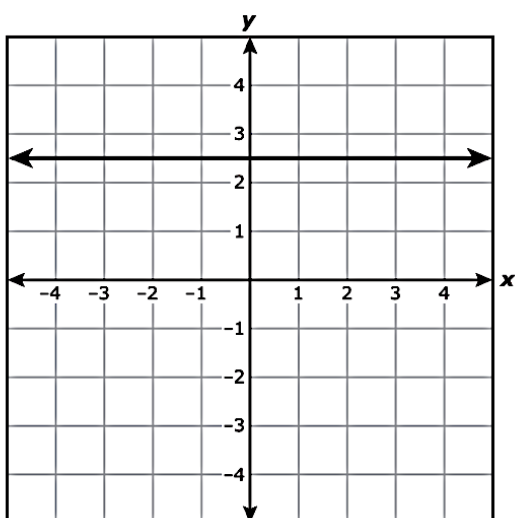


f. $2x + 3y = 12$

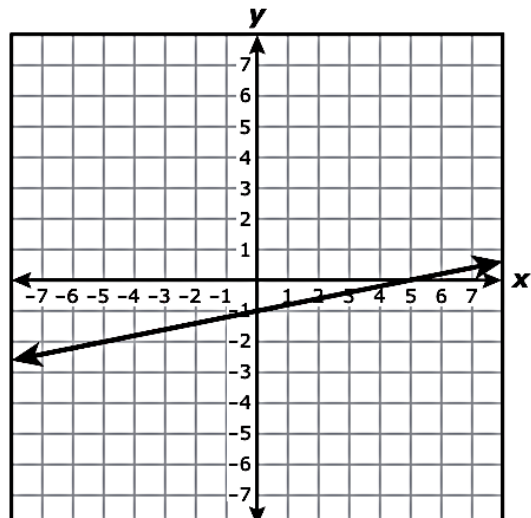


2. Write the equation in slope-intercept form (if possible) for the line shown in each graph.

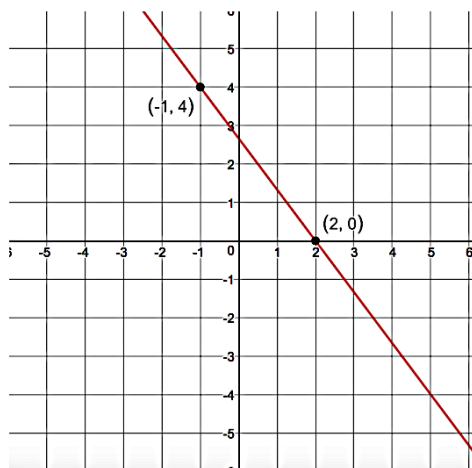
a.



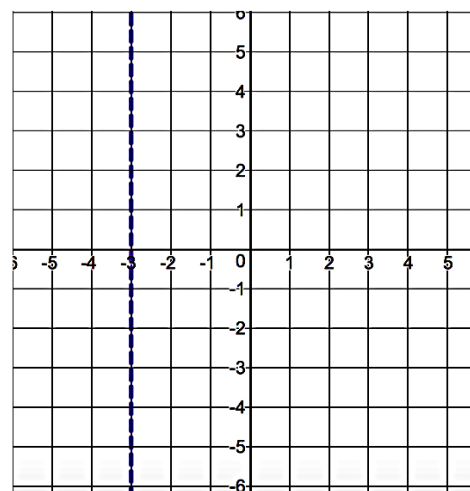
b.



c.



d.



3. Find the equation in slope-intercept form (if possible) for the line with the given characteristics.

a. a slope of 4, passing through the point $(0, -7)$

b. a slope of $\frac{3}{2}$, passing through the point $(1, -2)$

c. the line that passes through the points $(5, -1)$ and $(0, 3)$

d. the line that passes through the points $(4, 8)$ and $(4, -13)$

e. the line that passes through the point $(-10, 3)$ and is parallel to the line $y = -\frac{2}{5}x + 3$

f. the line that passes through the point $(6, -1)$ and is parallel to the line $8x + 3y = 15$

g. the line that passes through the point $(1, -5)$ and is perpendicular to the line $-x + 8y = 16$

h. the line that passes through the point $(10, 36)$ and is perpendicular to the line $y = 5$

4. A ride-sharing service charges \$0.50 per mile, plus a base fee of \$12.00.
- Write an equation in slope-intercept form for cost as a function of distance traveled, where y represents cost (in dollars) and x represents distance traveled (in miles).
 - What is the y -intercept of this function (include units!), and what does it represent in the context of this problem?
 - Find the x -intercept of this function (including a unit!), and explain why it isn't really meaningful in the context of this problem.
 - Find the slope of this function (including units!), and explain what it means in the context of this problem.
 - Use your equation to calculate how much a 24-mile ride would cost.
 - Use your equation to find the distance that would cost \$42.00.

PART VI: FUNCTION NOTATION

Concepts you must know:

- | | |
|--|---|
| <ul style="list-style-type: none">evaluating functions algebraicallyevaluating functions from a graph | <ul style="list-style-type: none">solving for the input, given an output valuethe vertical line test |
|--|---|

1. Let the functions $f(x)$, $g(x)$, and $h(x)$ be defined as shown below. Use these functions to answer the questions that follow.

$$f(x) = x^2 - 3x$$

$$g(x) = -4(x - 15)^2 + 2$$

$$h(x) = \frac{12}{x}$$

a. $f(-2)$

b. $g(12)$

c. $h\left(\frac{3}{2}\right)$

d. $g\left(\frac{31}{2}\right)$

e. Find x if $h(x) = 24$.

f. Find x if $h(x) = \frac{1}{3}$.

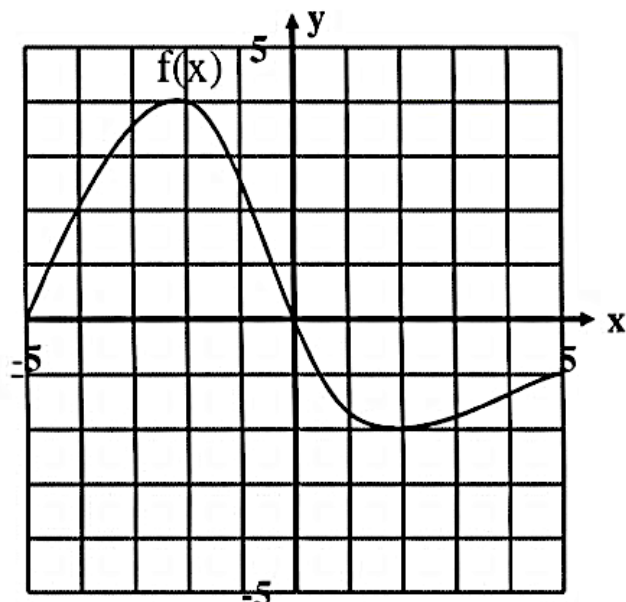
2. Given the graph of $f(x)$ below, find the following.

a. $f(2)$

b. $f(-5)$

c. For what x value(s) does $f(x)$ equal 4?

d. For what x value(s) does $f(x)$ equal -1 ?



PART VII: FACTORING

Concepts you must know:

- | | |
|---|---|
| <ul style="list-style-type: none">• factoring basic trinomials• factoring a difference of squares• factoring a perfect square | <ul style="list-style-type: none">• factoring by splitting the middle term• factoring by grouping• $a^2 + b^2 \neq (a + b)^2$ (A sum of squares is prime!) |
|---|---|

Factor each expression below, if possible. If an expression can't be factored, state that it is prime. (NOTE: These are NOT equations. You are not solving for the variable! Your final answer will be a factored expression, not a set of numbers.)

1. $3x^2 - 12x$

2. $15t^3 + 12t^2$

3. $x^2 - x - 56$

4. $y^2 + 16y + 64$

5. $t^2 - 6t + 9$

6. $3p^2 - 2p - 5$

7. $-6a^2 - 25a - 25$

8. $2n^2 + 6n - 108$

9. $n^2 - 25$

10. $x^2 + 16$

11. $8r^3 - 64r^2 + r - 8$

12. $12x^3 + 2x^2 - 30x - 5$

PART VIII: QUADRATIC EQUATIONS

Concepts you must know:	
• solving by factoring • solving by taking a square root	• solving by completing the square • using the quadratic formula

Solve each equation over the set of real numbers. Use any appropriate method (factoring, taking a square root, completing the square, or using the quadratic formula).

1. $x^2 - 4x - 5 = 0$

2. $4t^2 + 9t + 5 = 0$

3. $2c^2 = 3c$

4. $16y^2 = 49$

5. $200x^4 + 80x^3 + 8x^2 = 0$

6. $n^2 + 8 = 80$

7. $x^2 - 8x + 21 = 6$

8. $z^2 + 7z - 45 = 7$

PART I: NUMBERS AND OPERATIONS

Concepts you must know:

- subsets of real numbers: natural numbers, integers, rational and irrational numbers
- order of operations (PEMDAS)
- reducing, adding, subtracting, multiplying, and dividing fractions
- division by zero is undefined

1. Each number below belongs to one or more of the following sets: the **natural numbers**, **integers**, **rational numbers**, and **irrational numbers**. List all of the sets to which each number belongs.

a. -29

B, C

b. $\sqrt{3}$

D

c. $\frac{8}{3}$

C

d. π

D

e. 17

A, B, C

f. 3.084

C

2. Which of the following is equal to zero, and which is undefined? Why?

a. $\frac{0}{12}$

zero, because $0 \div \text{anything} = 0$

b. $\frac{12}{0}$

undefined since no number times $0 = 12$

3. Which of the following is positive, and which is negative? Why?

a. -5^2

negative (exponent then multiplier by neg. 1)

b. $(-5)^2$

positive $(-5)(-5)$

4. Use the correct order of operations to simplify the following expressions by hand. If your answer is a fraction, reduce it fully.

a. $-3^2 + 20 - 2 \times 3$

$-9 + 20 - 6 = 5$

b. $(2 + 3)^2 - 2 + 12 \div 2^2$

$25 - 2 + 3 = 26$

c. $(-6)^2 \div 2^2 - 2(3)^2$

$36 \div 4 - 18 = 9 - 18 = -9$

d. $\sqrt{3^2 + 4^2}$

$\sqrt{25} = 5$

e. $\frac{7}{8} - \frac{5}{12} + \left(\frac{1}{2}\right)^2$

$\frac{7}{8} - \frac{5}{12} + \frac{1}{4} = \frac{21}{24} - \frac{10}{24} + \frac{6}{24}$

g. $3 \div \frac{2}{3} - 5 \times \frac{1}{4}$

$3 \cdot \frac{3}{2} - \frac{5}{4} = \frac{9}{2} - \frac{5}{4} = \frac{18}{4} - \frac{5}{4} = \frac{13}{4}$

f. $2 \times \frac{2}{3} + \frac{1}{3} \div 2$

$\frac{4}{3} + \frac{1}{6} = \frac{8}{6} + \frac{1}{6} = \frac{9}{6} = \frac{3}{2}$

h. $\frac{5}{6} \div \frac{1}{2} - \frac{4}{27} \times \left(\frac{3}{2}\right)^2$

$\frac{5}{6} \cdot \frac{2}{1} - \frac{4}{27} \cdot \frac{9}{4} = \frac{5}{3} - \frac{1}{3} = \frac{4}{3}$

i. $\frac{\frac{15}{8}}{\frac{5}{2}}$

$\frac{15}{8} \div \frac{5}{2} = \frac{15}{8} \cdot \frac{2}{5} = \frac{3}{4}$

j. $\frac{\frac{3}{2}}{2} + \frac{2}{\frac{2}{3}}$

$\frac{3}{2} \cdot \frac{1}{2} + 2 \cdot \frac{3}{2} = \frac{3}{4} + 3 = \frac{10}{4} = \frac{5}{2}$

PART II: LAWS OF EXPONENTS

Concepts you must know:

- $a^0 = 1$
- $a^n \cdot a^m = a^{n+m}$
- $a^n \div a^m = a^{n-m}$
- $(a^n)^m = a^{nm}$
- $a^{-n} = 1/a^n$
- $(a + b)^n \neq a^n + b^n$ (Exponents do NOT distribute!)

Simplify each expression, eliminating all negative exponents and reducing all fractions.

1. $x^5 x^3$

$$x^8$$

2. $\frac{x^5}{x^3}$

$$x^2$$

3. $(x^5)^3$

$$x^{15}$$

4. $\frac{x^3}{x^5}$

$$x^{-2} = \frac{1}{x^2}$$

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

$$9x^8$$

6. $(2xy^2)^0$

$$1$$

7. $-2^3(2xy^2)^2$

$$-8(4x^2y^4) = -32x^2y^4$$

8. $3x^{-2}$

$$\frac{3}{x^2}$$

9. $\frac{1}{15x^{-3}}$

$$\frac{x^3}{15}$$

10. $(15x^0y^2z^{34})(3x^{16}y^{-29}z^0)$

$$\frac{45x^{16}y^2z^{34}}{y^{29}}$$

11. $\frac{9x^6y^{-3}}{12x^{-2}y^4}$

$$\frac{3x^8}{4y^7}$$

12. $\left(\frac{-2a^2b^3c^0}{3a^3b^3c^7}\right)^{-2}$

$$\left(\frac{3a^3b^3c^7}{-2a^2b^3c^0}\right)^2 = \frac{9a^6b^6c^{14}}{4a^4b^6} = \frac{9a^2c^{14}}{4}$$

PART III: POLYNOMIAL OPERATIONS

Concepts you must know:

- combining like terms
- distributing negatives when appropriate
- FOIL and how to square a binomial
- multiplying one polynomial by another

Perform the indicated operation, combine like terms, and simplify as much as possible.

1. $(3x - 5) + (6x - 4)$

$$9x - 9$$

2. $\frac{2t}{3}(12t^2 + 15)$

$$8t^3 + 10t$$

3. $(y - 3)^2 = (y - 3)(y - 3)$

$$y^2 - 6y + 9$$

4. $(10 - 3p)(3p + 10)$

$$30p + 100 - 9p^2 - 30p$$

$$100 - 9p^2$$

5. $(gh^2 - 4gh) - (2gh + 3gh^2) - (2 - 5gh)$

$$gh^2 - 4gh - 2gh - 3gh^2 - 2 + 5gh$$

$$-2gh^2 - gh - 2$$

6. $(5x - 3y)(5x + 3y)$

$$25x^2 - 9y^2$$

7. $(4xy - 2y + 3x) + (3xy - 6y + 6x)$

$$7xy - 8y + 9x$$

8. $(2m - 3n)^2$

$$(2m - 3n)(2m - 3n)$$

$$4m^2 - 12n + 9n^2$$

9. $(4c^2 - 8cd - 6c) + 2(5 + 2c^2 - 5cd)$

$$4c^2 - 8cd - 6c + 10 + 4c^2 - 10cd$$

$$8c^2 - 18cd - 6c + 10$$

10. $(5c^2 + r) - 3(7c - 4 + c^2)$

$$5c^2 + r - 21c + 12 - 3c^2$$

$$2c^2 - 21c + r + 12$$

11. $(6x^2 - x^3) + 2(x - 2x^2) - 3(7x - 2x^3)$

$$6x^2 - x^3 + 2x - 4x^2 - 21x + 6x^3$$

$$5x^3 + 2x^2 - 19x$$

12. $2t(t + 3)(t^2 - 4t + 5)$

$$(2t^2 + 6t)(t^2 - 4t + 5)$$

$$2t^4 - 8t^3 + 10t^2 + 6t^3 - 24t^2 + 30t$$

$$2t^4 - 2t^3 - 14t^2 + 30t$$

PART IV: LINEAR EQUATIONS

Concepts you must know:

- the golden rule of algebra
- isolating a variable
- eliminating fractions
- checking your answer (by plugging it back in)
- solving systems by substitution
- solving systems by elimination

Solve each equation by hand. If there is no solution or the solution is all real numbers, explain why.

2. $4x - 1 = \frac{x}{3} \cdot 3$

$$12x - 3 = x$$

$$11x = 3$$

$$\boxed{x = 3/11}$$

3. $\frac{1}{2}(2 - 4x) + 2x = 13$

$$1 - 2x + 2x = 13$$

$$1 = 13$$

no solution

5. $-5(4u - 2) = -2(3 + 6u)$

$$-20u + 10 = -6 - 12u$$

$$16 = 8u$$

$$\boxed{u = 2}$$

7. $12 + 2n - n = 9n - 4$

$$12 + n = 9n - 4$$

$$16 = 8n$$

$$\boxed{n = 2}$$

2. $2\left(\frac{x-3}{2} + 5\right) = 1 \cdot 2$

$$x - 3 + 10 = 2$$

$$x + 7 = 2$$

$$\boxed{x = -5}$$

24. $4. \left(d + \frac{d+7}{8} - \frac{5d}{6}\right) = -\frac{1}{12} \cdot 24$

$$24d + 3(d+7) - 4(5d) = -2$$

$$24d + 3d + 21 - 20d = -2$$

$$7d = -23$$

$$\boxed{d = -23/7}$$

2/3. $\left(\frac{3}{2}(2x+6)\right) = 3x+9 \cdot \frac{2}{3}$

$$2x+6 = 2x+6$$

x is any real number

18. $8\left(\frac{4}{9}t - 12\right) = \frac{1}{6}(t - 12) - 3 \cdot 18$

$$8t - 216 = 3(t - 12) - 54$$

$$8t - 216 = 3t - 36 - 54$$

$$5t = 216 - 36 - 54$$

$$5t = 126$$

$$\boxed{t = 126/5}$$

Solve each system of equations using the indicated method. Express your answer as an ordered pair.

9. Solve by substitution:

$$\begin{cases} y = 2x - 1 \\ 5x + 2y = 34 \end{cases}$$

$$5x + 2(2x - 1) = 34$$

$$5x + 4x - 2 = 34$$

$$9x - 2 = 34$$

$$9x = 36$$

$$x = 4$$

$$y = 2(4) - 1$$

$$y = 8 - 1 = 7$$

$$\boxed{(4, 7)}$$

11. Solve by elimination:

$$\begin{cases} 2x - 5y = -13 \\ -x + 7y = 11 \end{cases}$$

$$\begin{aligned} 2x - 5y &= -13 \\ 2(-x + 7y) &= 22 \end{aligned}$$

$$\begin{aligned} 2x - 5y &= -13 \\ -2x + 14y &= 22 \\ \hline 9y &= 9 \end{aligned}$$

$$y = 1$$

$$2x - 5(1) = -13$$

$$2x = -8$$

$$x = -4$$

$$\boxed{(-4, 1)}$$

10. Solve by substitution:

$$\begin{cases} x - 3y = -2 \\ 3x + 2y = 27 \end{cases}$$

$$x = -2 + 3y$$

$$3(-2 + 3y) + 2y = 27$$

$$-6 + 9y + 2y = 27$$

$$11y = 33$$

$$y = 3$$

$$\begin{aligned} x &= -2 + 3(3) \\ x &= 7 \end{aligned}$$

$$\boxed{(7, 3)}$$

12. Solve by elimination:

$$\begin{cases} 3x + 2y = 23 \\ 2x + 3y = 22 \end{cases}$$

$$\begin{aligned} -3(3x + 2y) &= -3(23) \\ 2(2x + 3y) &= 2(22) \end{aligned}$$

$$-9x - 6y = -69$$

$$4x + 6y = 44$$

$$\begin{aligned} -9x - 6y &= -69 \\ 4x + 6y &= 44 \\ \hline -5x &= -25 \end{aligned}$$

$$x = 5$$

$$3(5) + 2y = 23$$

$$15 + 2y = 23$$

$$2y = 8$$

$$y = 4$$

$$\boxed{(5, 4)}$$

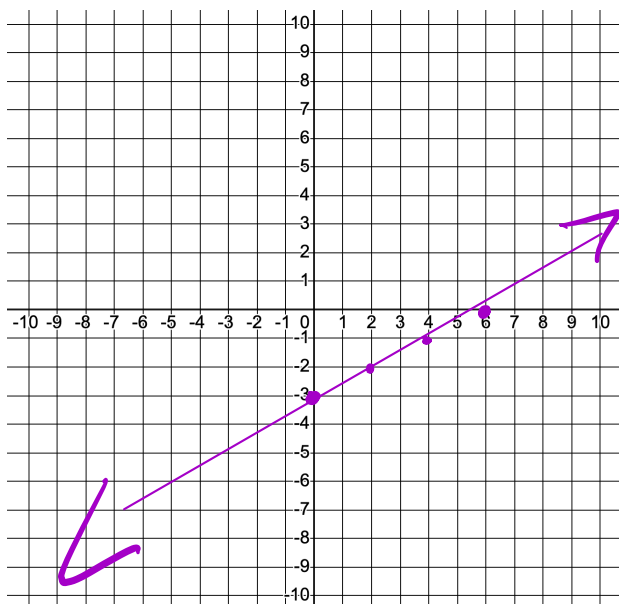
PART V: LINEAR FUNCTIONS

Concepts you must know:

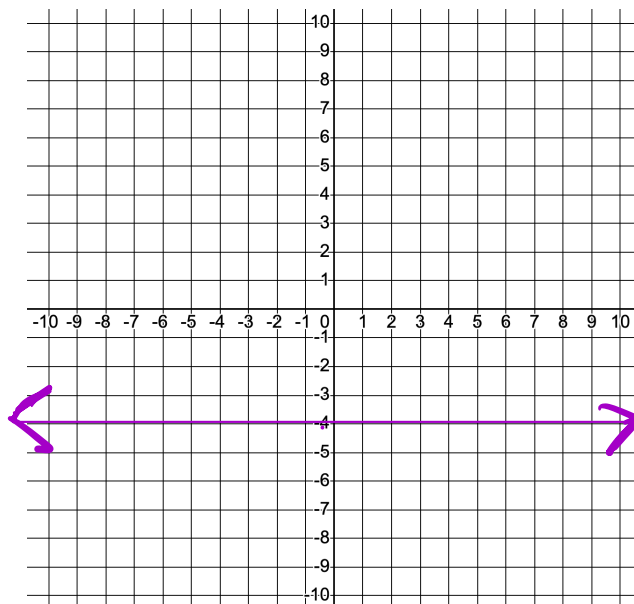
- slope-intercept form
- finding an equation from a graph
- equations for horizontal and vertical lines
- parallel and perpendicular lines

1. Graph the line represented by each equation on the axes provided.

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

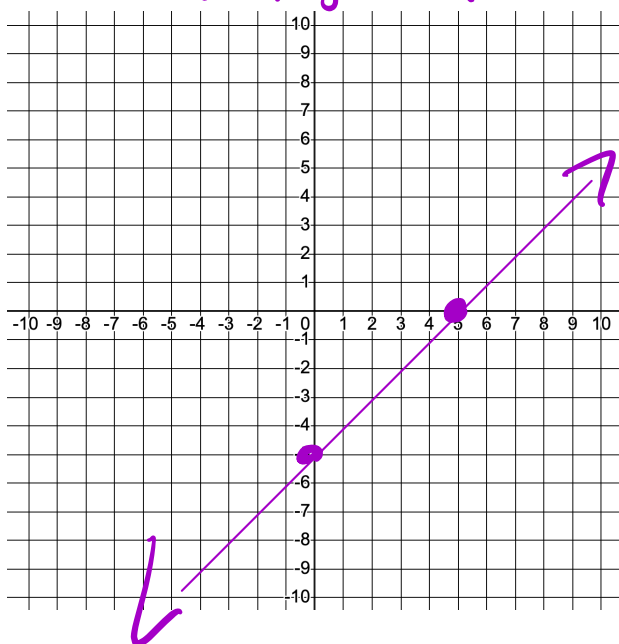


b. $y = -4$

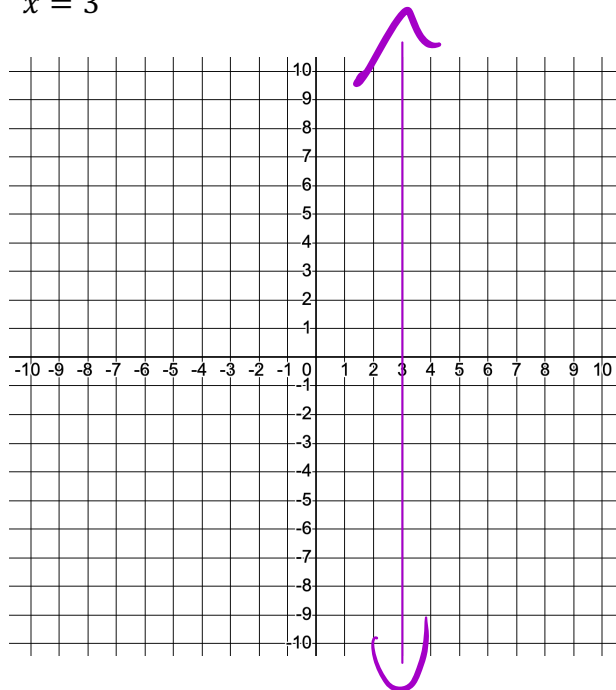


c. $x - y = 5$

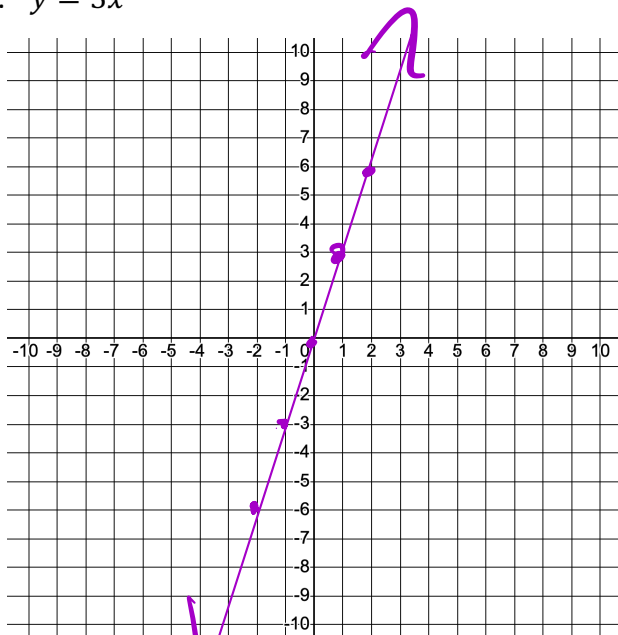
when $x=0$ $y=-5$
when $y=0$ $x=5$



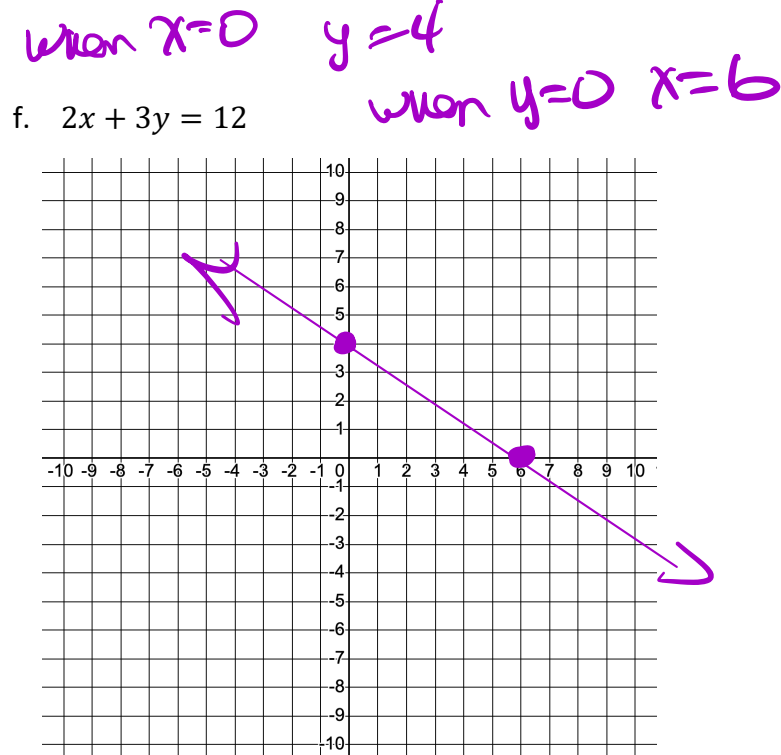
d. $x = 3$



e. $y = 3x$

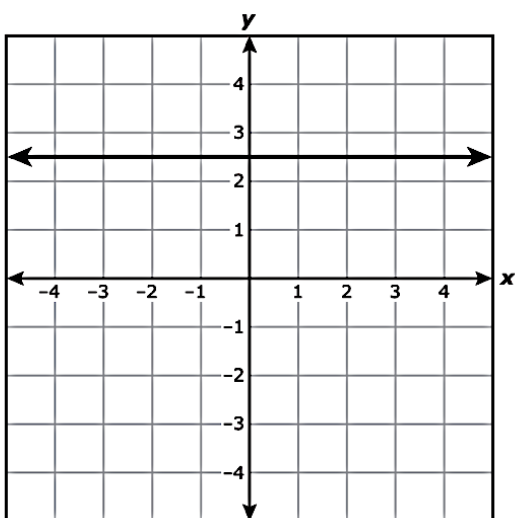


f. $2x + 3y = 12$



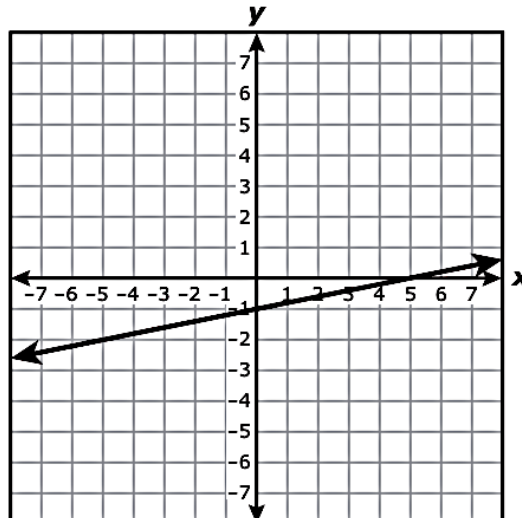
2. Write the equation in slope-intercept form (if possible) for the line shown in each graph.

a.



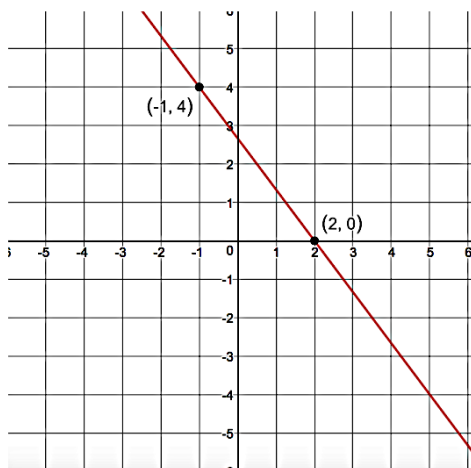
$y = 2.5$ or $y = 0x + 2.5$

b.



$y = \frac{1}{7}x - 1$

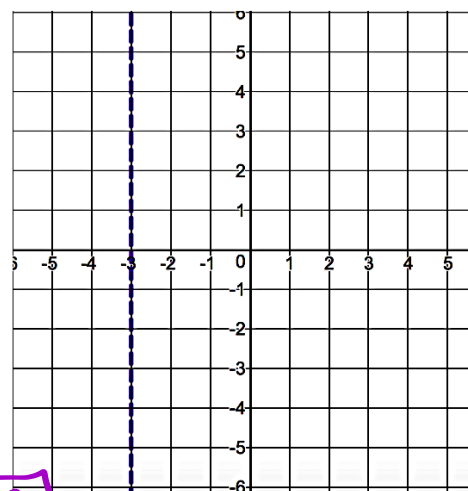
c.



$m = -\frac{4}{3}$

$y = -\frac{4}{3}(x-2) \Rightarrow y = -\frac{4}{3}x + \frac{8}{3}$

d.



$x = -3$

3. Find the equation in slope-intercept form (if possible) for the line with the given characteristics.

- a. a slope of 4, passing through the point $(0, -7)$

$$y = 4x - 7$$

- b. a slope of $\frac{3}{2}$, passing through the point $(1, -2)$

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

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

$$y = \frac{3}{2}x - \frac{7}{2}$$

- c. the line that passes through the points $(5, -1)$ and $(0, 3)$ ← y-intercept

$$m = \frac{3 + 1}{0 - 5} = -\frac{4}{5}$$

$$y = -\frac{4}{5}x + 3$$

- d. the line that passes through the points $(4, 8)$ and $(4, -13)$

Same x

$$x = 4$$

- e. the line that passes through the point $(-10, 3)$ and is parallel to the line $y = -\frac{2}{5}x + 3$

parallel → same slope

$$y - 3 = -\frac{2}{5}(x + 10)$$

$$y - 3 = -\frac{2}{5}x - 6$$

$$y = -\frac{2}{5}x - 3$$

- f. the line that passes through the point $(6, -1)$ and is parallel to the line $8x + 3y = 15$

$$8x + 3y = 15 \rightarrow 3y = -8x + 15 \quad y = -\frac{8}{3}x + 5$$

$$m_{\perp} = -\frac{3}{8}$$

$$y + 1 = -\frac{8}{3}(x - 6) \Rightarrow y + 1 = -\frac{8}{3}x + 16 \Rightarrow y = -\frac{8}{3}x + 15$$

- g. the line that passes through the point $(1, -5)$ and is perpendicular to the line $-x + 8y = 16$

$$-x + 8y = 16 \quad -8y = x + 16 \quad y = -\frac{1}{8}x - 2$$

$$m_{\perp} = \text{neg. reciprocal} = 8$$

$$y + 5 = 8(x - 1)$$

$$y + 5 = 8x - 8 \quad y = 8x - 13$$

- h. the line that passes through the point $(10, 36)$ and is perpendicular to the line $y = 5$

$$x = 10$$

Must be an $x = a$

4. A ride-sharing service charges \$0.50 per mile, plus a base fee of \$12.00.
- a. Write an equation in slope-intercept form for cost as a function of distance traveled, where y represents cost (in dollars) and x represents distance traveled (in miles).

$$y = 0.5x + 12$$

- b. What is the y -intercept of this function (include units!), and what does it represent in the context of this problem?

The y -intercept is \$12. The represents the cost of a drive before any miles are driven.

- c. Find the x -intercept of this function (including a unit!), and explain why it isn't really meaningful in the context of this problem.

The x -intercept is $(-24, 0)$. A ride of -24 miles would have no cost.

- d. Find the slope of this function (including units!), and explain what it means in the context of this problem.

The slope is 50 cents/mile. For every additional mile of the trip the cost increases by 50 cents.

- e. Use your equation to calculate how much a 24-mile ride would cost.

$$0.5(24) + 12 = \$24$$

A 24 mile ride would cost \$24

- f. Use your equation to find the distance that would cost \$42.00.

$$42 = 0.5x + 12$$

$$30 = 0.5x$$

$$60 = x$$

You could travel 60 miles on a \$42 budget.

PART VI: FUNCTION NOTATION

Concepts you must know:

- evaluating functions algebraically
- evaluating functions from a graph
- solving for the input, given an output value
- the vertical line test

1. Let the functions $f(x)$, $g(x)$, and $h(x)$ be defined as shown below. Use these functions to answer the questions that follow.

$$f(x) = x^2 - 3x$$

$$g(x) = -4(x - 15)^2 + 2$$

$$h(x) = \frac{12}{x}$$

a. $f(-2)$

$$f(-2) = (-2)^2 - 3(-2) \\ 4 + 6 = \boxed{10}$$

b. $g(12)$

$$g(12) = -4(12 - 15)^2 + 2 \\ = -4(-3)^2 + 2 = -36 + 2 = \boxed{-34}$$

c. $h\left(\frac{3}{2}\right)$

$$h\left(\frac{3}{2}\right) = \frac{12}{\frac{3}{2}} = 12 \div \frac{3}{2} \\ = 12 \cdot \frac{2}{3} = \boxed{8}$$

d. $g\left(\frac{31}{2}\right)$

$$g\left(\frac{31}{2}\right) = -4\left(\frac{31}{2} - 15\right)^2 + 2 \\ = -4\left(\frac{1}{2}\right)^2 + 2 = -1 + 2 = \boxed{1}$$

e. Find x if $h(x) = 24$.

$$\frac{12}{x} = 24$$

$$12 = 24x$$

$$\boxed{\frac{1}{2} = x}$$

f. Find x if $h(x) = \frac{1}{3}$.

$$\frac{12}{x} = \frac{1}{3}$$

$$12 = \frac{1}{3}x$$

$$\boxed{36 = x}$$

2. Given the graph of $f(x)$ below, find the following.

a. $f(2) = -2$

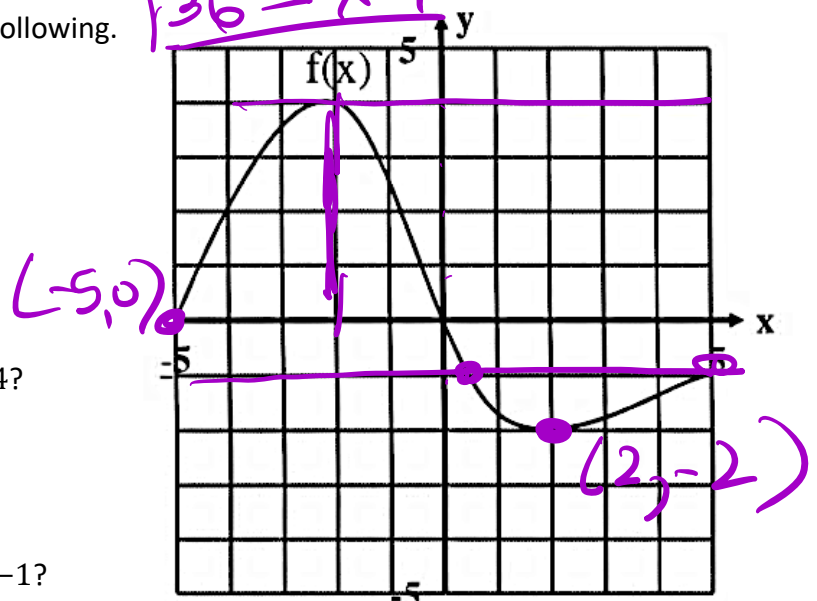
b. $f(-5) = 0$

- c. For what x value(s) does $f(x)$ equal 4?

$$-2$$

- d. For what x value(s) does $f(x)$ equal -1 ?

$$x = 0.5, x = 5$$



PART VII: FACTORING

Concepts you must know:

- | | |
|---|---|
| <ul style="list-style-type: none"> factoring basic trinomials factoring a difference of squares factoring a perfect square | <ul style="list-style-type: none"> factoring by splitting the middle term factoring by grouping $a^2 + b^2 \neq (a + b)^2$ (A sum of squares is prime!) |
|---|---|

Factor each expression below, if possible. If an expression can't be factored, state that it is prime. (NOTE: These are NOT equations. You are not solving for the variable! Your final answer will be a factored expression, not a set of numbers.)

1. $3x^2 - 12x$

$$3x(x-4)$$

2. $15t^3 + 12t^2$

$$3t(5t^2 + 4)$$

3. $x^2 - x - 56$

$$(x-8)(x+7)$$

4. $y^2 + 16y + 64$

$$(y+8)(y+8)$$

$$(y+8)^2$$

5. $t^2 - 6t + 9$

$$(t-3)(t-3)$$

$$\text{or } (t-3)^2$$

6. $3p^2 - 2p - 5$

$$3 \cdot -5 = -15$$

$$3p^2 - 5p + 3p - 5$$

$$p(3p-5) + 1(3p-5)$$

$$(3p-5)(p+1)$$

7. $-6a^2 - 25a - 25$

$$-(6a^2 + 25a + 25)$$

$$6 \cdot 25 = 150$$

$$6a^2 + 15a + 10a + 25$$

$$3a(2a+5) + 5(2a+5)$$

$$(3a+5)(2a+5)$$

$$(n+5)(n-5)$$

8. $2n^2 + 6n - 108$

$$2(n^2 + 3n - 54)$$

$$2(n+9)(n-6)$$

10. $x^2 + 16$

prime over the set of real numbers

11. $8r^3 - 64r^2 + r - 8$

$$8r^2(r-8) + 1(r-8)$$

$$(r-8)(8r^2+1)$$

12. $12x^3 + 2x^2 - 30x - 5$

$$2x^2(6x+1) - 5(6x+1)$$

$$(6x+1)(2x^2-5)$$

PART VIII: QUADRATIC EQUATIONS

Concepts you must know:

- solving by factoring
- solving by completing the square
- solving by taking a square root
- using the quadratic formula

Solve each equation over the set of real numbers. Use any appropriate method (factoring, taking a square root, completing the square, or using the quadratic formula).

1. $x^2 - 4x - 5 = 0$

$$(x-5)(x+1)=0$$
$$\boxed{x=5 \text{ or } x=-1}$$

2. $4t^2 + 9t + 5 = 0$

$$4t^2 + 4t + 5t + 5 = 0$$
$$4t(t+1) + 5(t+1) = 0$$
$$(t+1)(4t+5) = 0$$
$$\boxed{t=-1 \text{ or } t=-5/4}$$

3. $2c^2 = 3c$

$$2c^2 - 3c = 0$$
$$c(2c-3) = 0$$
$$\boxed{c=0 \text{ or } c=3/2}$$

4. $16y^2 = 49$

$$16y^2 - 49 = 0$$
$$(4y+7)(4y-7) = 0$$
$$\boxed{y=-7/4 \text{ or } y=7/4}$$

5. $200x^4 + 80x^3 + 8x^2 = 0$

$$8x^2(25x^2 + 10x + 1) = 0$$
$$8x^2(5x+1)(5x+1) = 0$$
$$\boxed{x=0 \text{ or } x=-1/5}$$

6. $n^2 + 8 = 80$

$$\sqrt{n^2} = \sqrt{72}$$
$$|n| = \sqrt{72}$$
$$\boxed{n = \pm\sqrt{72} = \pm 6\sqrt{2}}$$

7. $x^2 - 8x + 21 = 6$

$$x^2 - 8x + 15 = 0$$
$$(x-5)(x-3) = 0$$
$$\boxed{x=5 \text{ or } x=3}$$

8. $z^2 + 7z - 45 = 7$

$$z^2 + 7z - 52 = 0$$
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
$$x = \frac{-7 \pm \sqrt{49 - 4(1)(-52)}}{2}$$
$$x = \frac{-7 \pm \sqrt{49 + 208}}{2}$$

$$x = \frac{-7 \pm \sqrt{257}}{2}$$