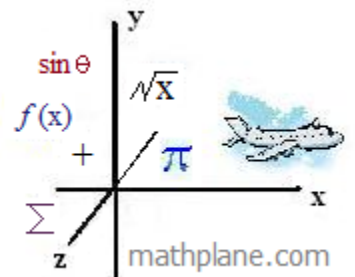


Algebra Review 2

Practice Exercises (with Solutions)

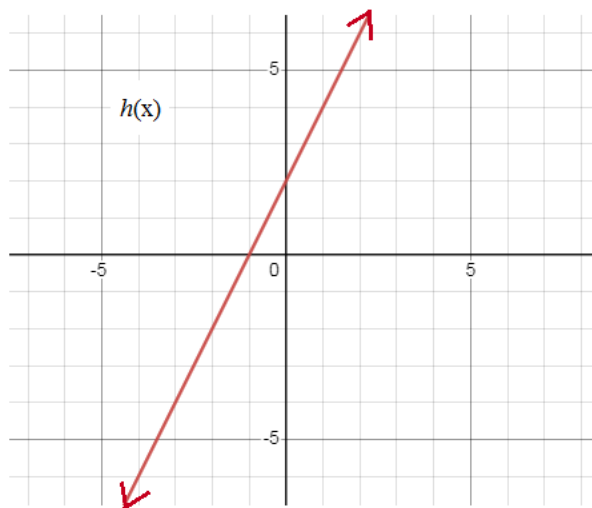
Topics include rational expressions, factoring, piecewise functions, domain & range, rate questions, inequalities, and more..



For the following functions, evaluate.

$$f(x) = 3x^2 + 1$$

x	0	1	2	3	4
g(x)	5	10	-1	2	-6



$$f(1) =$$

$$(f+h)(3) =$$

$$f(g(1)) =$$

$$g(1) =$$

$$(g+f)(2) =$$

$$g(f(0)) =$$

$$h(1) =$$

$$(f \cdot g)(0) =$$

$$h(f(-3)) =$$

$$f(7) =$$

$$\frac{f}{g}(0) =$$

$$g \circ h(1) =$$

$$g(7) =$$

$$\frac{g}{h}(1) =$$

$$h \circ g(1) =$$

$$h(7) =$$

If $f(x) = 28$, then $x =$

If $g(x) = 2$, then $x =$

If $h(x) = 4$, then $x =$

Rational Expressions Quiz

Simplify:

1) $\frac{x}{3} + \frac{x}{5}$

2) $\frac{1}{a+4} + \frac{3}{a+4}$

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

4) $\frac{3}{2x+6} + \frac{4}{6x+18}$

5) $\frac{7}{2d} - \frac{3}{2d}$

6) $\frac{2x}{x^2-1} - \frac{3}{x+1}$

7) $\frac{k-10}{20-2k}$

Solve:

1) $\frac{x}{x+2} + \frac{4}{x-2} = 1$

2) $\frac{1}{x} + \frac{1}{2x} = \frac{1}{6}$

3) $\frac{1}{3s} = \frac{s}{2} - \frac{1}{6s}$

4) $\frac{x+2}{x+8} = \frac{x-2}{x+4}$

5) $1 - \frac{3}{z} = \frac{4}{z^2}$

6) $\frac{d}{3} + \frac{1}{2} = \frac{1}{3d}$

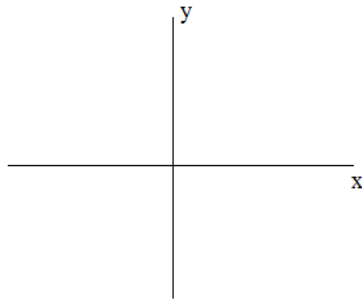
7) $\frac{1}{c-3} = \frac{c}{4}$

8) $\frac{5}{x-2} = \frac{5x+10}{x^2}$

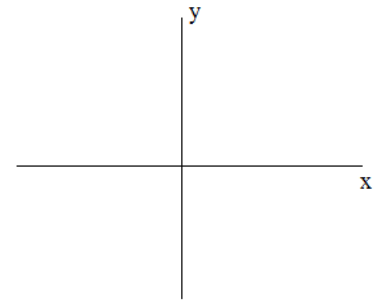
Algebra: Points and Lines

I. Determine (algebraically) if the given ordered pairs are solutions. Then, sketch the linear inequalities on a Cartesian plane. Plot the points to verify your answers!

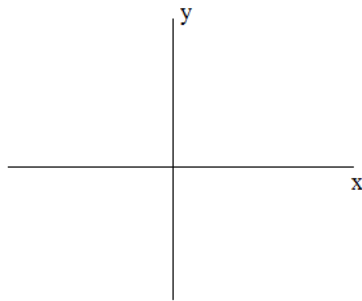
a) $y < -4x + 7$; (4, -8) (-2, 3)



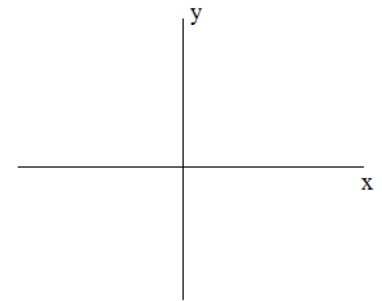
b) $x \leq -3$; (0, 2) (-3, 1)



c) $10x + y > -1.5$; (-1, 7) (0, 4)



d) $3y \geq 7$; (4, 1) (-3, 5)



II. Answer following

A) Which of the following points lie on the line $3x - 10y = 12$?

(4, 0) (1, -1) (10, 2) (14, 3)

B) Which of the following points does the line $y = 2x + 6$ pass through?

(4, 14) (-3, 0) (52, 110) (-32, -58)

Linear Algebra Review Questions

I. Determine if the line segments are parallel, perpendicular, or neither

1) \overline{RS} R(2, 2) S(4, 6)
 \overline{TV} T(7, 3) V(9, 2)

2) \overline{EF} E(7, 11) F(8, 15)
 \overline{LN} L(-1, 5) N(1, 11)

3) \overline{GH} G(76, 2) H(44, -30)
 \overline{JK} J(0, 0) K(7, 7)

4) \overline{AB} A(3, 1) B(3, 4)
 \overline{CD} C(1, 7) D(-3, 7)

5) \overline{MN} M(3, 4) N(8, 4)
 \overline{OP} O(1, 7) P(-1, 7)

II. Which of the following pairs are perpendicular?

1) $y - \frac{1}{2}x = 0$
 $y - 2x = -1$

2) $y = -x + 7$
 $y - x = 20$

3) $x = -1$
 $y = 3$

4) $3x + 6y = 11$
 $y - 6 = 2(x + \frac{1}{2})$

5) $y + 3 = -3(x + 4)$
 $y = 3x - 5$

Factoring Review: 5 examples

Quadratic Standard Form

$$Ax^2 + Bx + C$$

1) $25 - 16y^2$

2) $4t^2 - 13t - 12$

3) $2y^6 - 32y^2$

4) $6x^2 + x - 12$

5) $y^3 - 2y^2 - y + 2$

- 1) John leaves his house at 8:00 am, walking East at a speed of 5 miles/hour.
At noon, his brother leaves the house, and rides a bike in the same direction at 15 miles/hour.

- a) What time do the brothers meet?
- b) How far from home are they?

- 2) Train 1 and Train 2 are 300 miles apart.
At 9:00 am, Train 1 departs station A, heading North on the track at 60 mph.
At 10:00 am, Train 2 departs station B, heading South on a parallel track at 40 mph.

- a) When will the Trains pass each other?
- b) How far from station A are the trains when they meet?

- 3) Trains 3 and 4 sit at station C. At noon, train 3 departs, going West at 60 m/h.
At 3:00 train 4 departs, going East at 70 m/h.

- a) At 7:00, how far apart are the trains?
- b) When will the trains be 1200 miles apart?

4) A canoe goes up stream in 7 hours. Then, turns around and goes back downstream in 5 hours. If the rowers can paddle 20 km/hour in still water,

a) What is the rate of the stream?

b) How far did the canoe travel?

5) Bill can run 50 km in the same time that Joe can run 40 km. If Bill runs 2 km/hour faster than Joe, what are their running rates?

6) Alex bikes at a rate of 12 miles per hour. Tim bikes at a rate of 10 miles per hour. If Alex leaves school at 2:00 pm, and Tim leaves at 3:00 pm, when does Tim catch Alex?

Specific Solution Sets

Find the solution set. Then, graph on a number line.

1) $4x - 3 < 9$ $x \in \{\text{Real Numbers}\}$



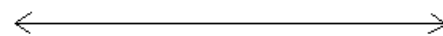
2) $|x - 2| > 5$ $x \in \{\text{Integers}\}$



3) $|x + 4| \leq 4$ $x \in \{\text{Integers}\}$



4) $2x + 7 < 18$ $x \in \{\text{Whole Numbers}\}$



5) $|3 - 4x| < 9$ $x \in \{\text{Positive Numbers}\}$

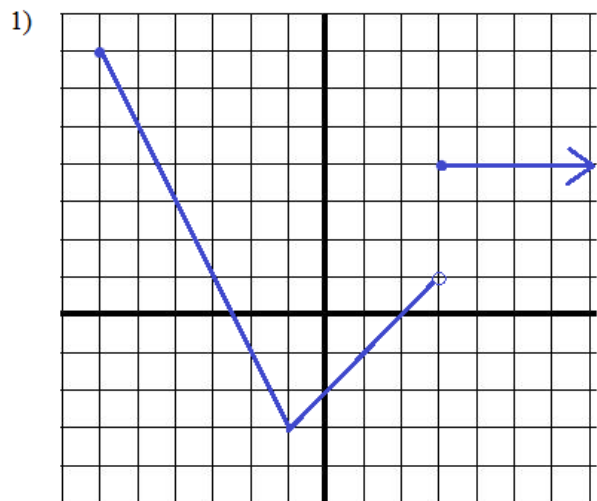


6) $\frac{(x + 2)(x - 5)}{(x + 1)} \leq 0$ $x \in \{\text{Real Numbers}\}$



Piecewise Functions, Domain and Range

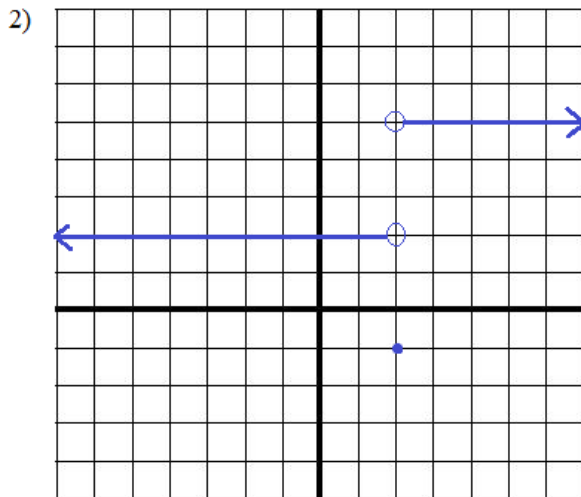
Find the domain and range. Then, write the equation.



Domain:

Range:

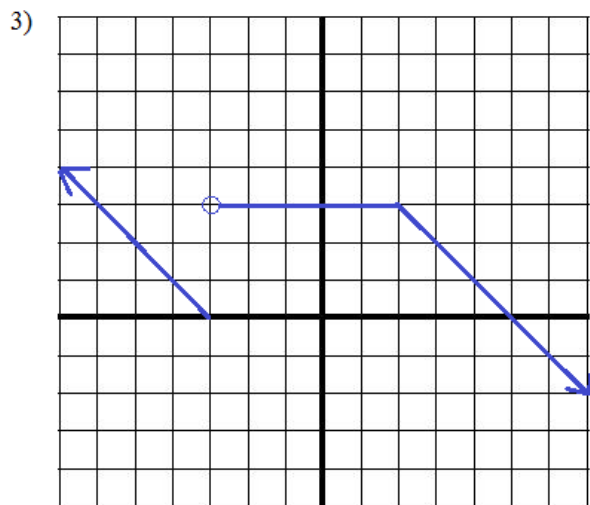
Function:



Domain:

Range:

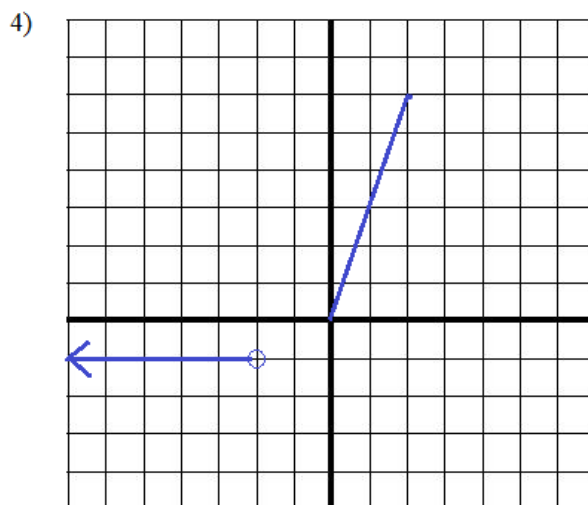
Function:



Domain:

Range:

Function:



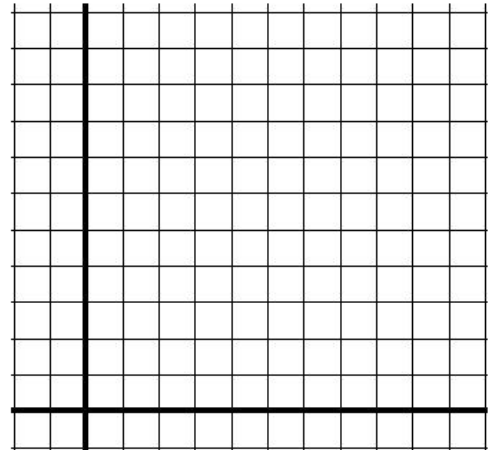
Domain:

Range:

Function:

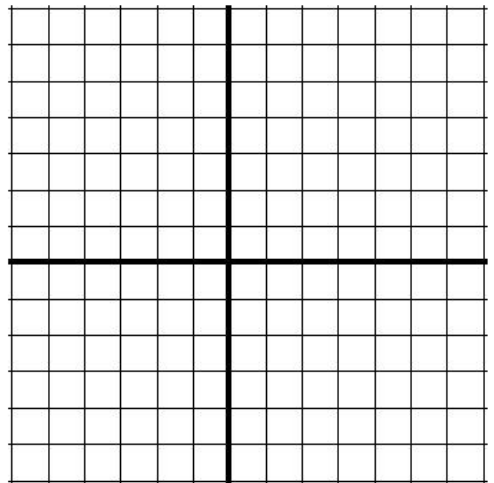
Algebra Graphing Review

1) John receives a \$60 gift card to the movie theater. If evening shows are \$10 and matinees are \$6, how many movie tickets can he afford? (graph the inequality)

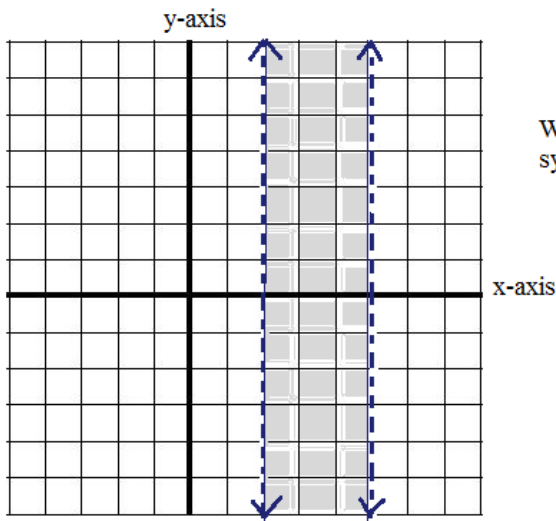


2)
$$f(x) = \begin{cases} -x + 2 & \text{if } 0 \leq x < 2 \\ -x + 4 & \text{if } 2 \leq x \leq 5 \end{cases}$$

Graph the function (for the interval $[0, 5]$)



3)



Write equations that describe the system of inequalities (on the left)

"Remember the formula for success.
Check your work.
Go back over the tough questions.
Think of the reward for a job well done."



"Screw that..
The teacher gives partial credit.
Let's watch t.v."



LanceAF #111 11/7/13
mathplane.com

*Skip got a disappointing C+ on the math assignment...
(but, he did see 2 awesome reruns of Magnum P.I.)*

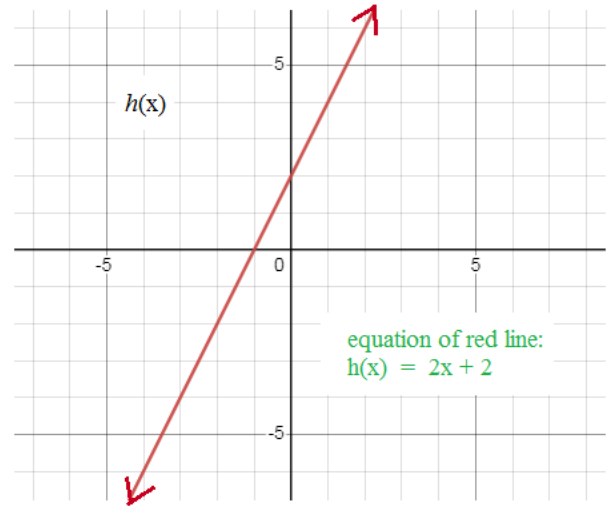
SOLUTIONS

For the following functions, evaluate.

SOLUTIONS

$$f(x) = 3x^2 + 1$$

x	0	1	2	3	4
g(x)	5	10	-1	2	-6



$$f(1) = 4 \quad \text{plug into equation} \quad (f+h)(3) = 28 + 8 = 36$$

$$g(1) = 10 \quad \text{find in the chart} \quad (g+f)(2) = -1 + 13 = 12$$

$$h(1) = 4 \quad \text{corresponds to (1, 4) on the graph} \quad (f \cdot g)(0) = 1 \times 5 = 5$$

$$f(7) = 148 \quad \frac{f}{g}(0) = \frac{1}{5}$$

$$g(7) = \text{does not exist}$$

$$h(7) = 16$$

$$\frac{g}{h}(1) = \frac{10}{4}$$

$$f(g(1)) = g(1) = 10 \text{ then, } f(10) = 301$$

$$g(f(0)) = f(0) = 1 \text{ then, } g(1) = 10$$

$$h(f(-3)) = f(-3) = 28 \text{ then, } h(28) = 58$$

equation of red line is $y = 2x + 2$

$$g \circ h(1) = h(1) = 4 \text{ then, } g(4) = -6$$

$$h \circ g(1) = g(1) = 10 \text{ then, } h(10) = 22$$

If $f(x) = 28$, then $x = 3$ or -3 set $3x^2 + 1 = 28$

If $g(x) = 2$, then $x = 3$ $g(3) = 2$

If $h(x) = 4$, then $x = 1$ $(1, 4)$ on the graph

Rational Expressions Quiz

SOLUTIONS

Simplify:

1) $\frac{x}{3} + \frac{x}{5}$

$$\frac{5x}{15} + \frac{3x}{15} = \frac{8x}{15}$$

2) $\frac{1}{a+4} + \frac{3}{a+4}$

$$\frac{4}{a+4}$$

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

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

4) $\frac{3}{2x+6} + \frac{4}{6x+18}$

$$\frac{3}{2(x+3)} + \frac{4}{6(x+3)} = \frac{9}{6(x+3)} + \frac{4}{6(x+3)} = \frac{13}{6(x+3)}$$

5) $\frac{7}{2d} - \frac{3}{2d}$

$$\frac{4}{2d} = \frac{2}{d}$$

6) $\frac{2x}{x^2-1} - \frac{3}{x+1}$

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

7) $\frac{k-10}{20-2k}$

$$\frac{k-10}{-2(k-10)} = -\frac{1}{2}$$

Solve: (Plug in to check solutions)

1) $\frac{x}{x+2} + \frac{4}{x-2} = 1$

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

$$\frac{x^2-2x+4x+8}{x^2-4} = \frac{1}{1} \quad \frac{(-6)}{(-6)+2} + \frac{4}{(-6)-2}$$

$$x^2-4 = x^2+2x+8 \quad \frac{3}{2} + \frac{4}{-8} = 1 \checkmark$$

$$x = -6$$

2) $\frac{1}{x} + \frac{1}{2x} = \frac{1}{6}$

Use common denominator

$$\frac{6}{6x} + \frac{3}{6x} = \frac{x}{6x} \quad \frac{1}{(9)} + \frac{1}{2(9)} = \frac{1}{6}$$

$$\frac{9}{6x} = \frac{x}{6x} \quad \frac{2}{18} + \frac{1}{18} = \frac{3}{18} \checkmark$$

$$x = 9$$

3) $\frac{1}{3s} = \frac{s}{2} - \frac{1}{6s}$

multiply by 6s

$$2 = 3s^2 - 1$$

$$3s^2 = 3$$

$$s = 1, -1$$

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

$$\frac{1}{3} = \frac{1}{2} - \frac{1}{6} \checkmark$$

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

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

4) $\frac{x+2}{x+8} = \frac{x-2}{x+4}$

cross multiply

$$x^2+2x+4x+8 = x^2+8x-2x-16$$

$$6x+8 = 6x-16$$

No solution!

5) $1 - \frac{3}{z} = \frac{4}{z^2}$

multiply by z^2

$$z^2 - 3z = 4 \quad 1 - \frac{3}{(4)} = \frac{4}{(4)^2}$$

$$z^2 - 3z - 4 = 0 \quad 1 - 3/4 = 1/4 \checkmark$$

$$(z-4)(z+1) = 0 \quad 1 - \frac{3}{(-1)} = \frac{4}{(-1)^2}$$

$$z = 4, -1 \quad 1 - (-3) = 4/1 \checkmark$$

6) $\frac{d}{3} + \frac{1}{2} = \frac{1}{3d}$

multiply by 6d

$$2d^2 + 3d = 2$$

$$2d^2 + 3d - 2 = 0$$

$$(2d-1)(d+2) = 0$$

$$d = 1/2, -2$$

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

$$-\frac{4}{6} + \frac{3}{6} = \frac{1}{-6} \checkmark$$

$$\frac{(1/2)}{3} + \frac{1}{2} = \frac{1}{3(1/2)}$$

$$\frac{1}{6} + \frac{3}{6} = \frac{2}{3} \checkmark$$

7) $\frac{1}{c-3} = \frac{c}{4}$

cross multiply

$$c^2 - 3c = 4$$

$$c^2 - 3c - 4 = 0$$

$$(c-4)(c+1) = 0$$

$$c = 4, -1$$

$$\frac{1}{(4)-3} = \frac{(4)}{4} \checkmark$$

$$\frac{1}{(-1)-3} = \frac{(-1)}{4} \checkmark$$

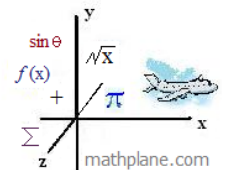
8) $\frac{5}{x-2} = \frac{5x+10}{x^2}$

cross multiply

$$5x^2 = 5x^2 - 10x + 10x - 20$$

$$5x^2 = 5x^2 - 20$$

No Solution!



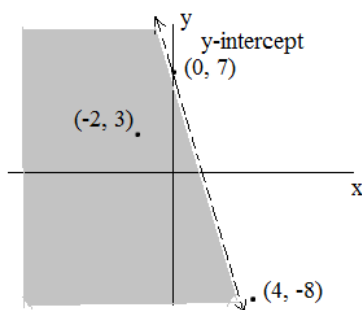
I. Determine (algebraically) if the given ordered pairs are solutions. Then, sketch the linear inequalities on a Cartesian plane. Plot the points to verify your answers!

a) $y < -4x + 7$; (4, -8) (-2, 3)

Test each point:

(4, -8): $-8 < -4(4) + 7$
 $-8 < -9$
 NOT a solution

(-2, 3): $3 < -4(-2) + 7$
 $3 < 15$
 SOLUTION

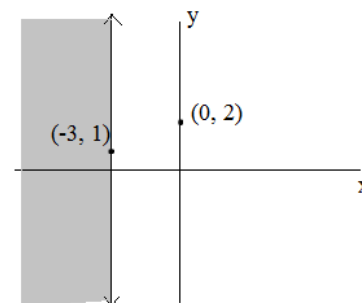


b) $x \leq -3$; (0, 2) (-3, 1)

Test each point:

(0, 2): $0 \leq -3$
 NOT a solution

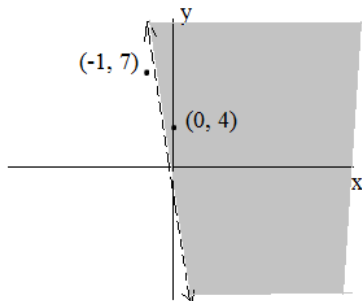
(-3, 1): $-3 \leq -3$
 SOLUTION



c) $10x + y > -1.5$; (-1, 7) (0, 4)

(-1, 7): $10(-1) + (7) > -1.5$
 $-3 > -1.5$
 NOT a solution

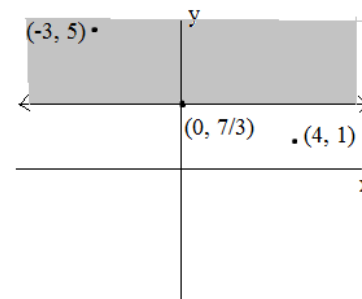
(0, 4): $10(0) + 4 > -1.5$
 $4 > -1.5$
 SOLUTION



d) $3y \geq 7$; (4, 1) (-3, 5)

(4, 1): $3(1) \geq 7$
 $3 \geq 7$
 NOT a solution

(-3, 5): $3(5) \geq 7$
 $15 \geq 7$
 SOLUTION



II. Answer following

A) Which of the following points lie on the line $3x - 10y = 12$?

- (4, 0) (1, -1) (10, 2) (14, 3)

$3(4) - 10(0) = 12$
 YES

$3(1) - 10(-1) = 13$
 $\neq 12$
 NO

$3(10) - 10(2) = 10$
 $\neq 12$
 NO

$3(14) - 10(3) = 12$
 YES

B) Which of the following points does the line $y = 2x + 6$ pass through?

- (4, 14) (-3, 0) (52, 110) (-32, -58)

ALL OF THEM!!

$(14) = 2(4) + 6$
 $14 = 14$

$(0) = 2(-3) + 6$
 $0 = 0$

$(110) = 2(52) + 6$
 $110 = 110$

$(-58) = 2(-32) + 6$
 $-58 = -58$

Linear Algebra Review Questions

SOLUTIONS

I. Determine if the line segments are parallel, perpendicular, or neither

- 1) \overline{RS} R(2, 2) S(4, 6) slope = 2
 \overline{TV} T(7, 3) V(9, 2) slope = $-\frac{1}{2}$ perpendicular
- 2) \overline{EF} E(7, 11) F(8, 15) slope = 4
 \overline{LN} L(-1, 5) N(1, 11) slope = 3 neither
- 3) \overline{GH} G(76, 2) H(44, -30) slope = $32/32 = 1$
 \overline{JK} J(0, 0) K(7, 7) slope = $7/7 = 1$ parallel
- 4) \overline{AB} A(3, 1) B(3, 4) slope is undefined ("no slope") ----> vertical line segment
 \overline{CD} C(1, 7) D(-3, 7) slope is 0 ----> horizontal line segment perpendicular
- 5) \overline{MN} M(3, 4) N(8, 4) slope is 0 (horizontal)
 \overline{OP} O(1, 7) P(-1, 7) slope is 0 (horizontal) parallel

$$\text{slope} = \frac{\text{"rise"}}{\text{"run"}} = \frac{\Delta y}{\Delta x} = \frac{y_1 - y_2}{x_1 - x_2}$$

parallel lines: slopes are equal

perpendicular lines: opposite reciprocals

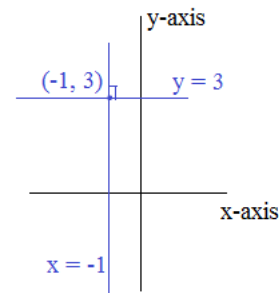
II. Which of the following pairs are perpendicular?

The slopes of perpendicular lines are opposite reciprocals..

- 1) $y - \frac{1}{2}x = 0$ slope = $1/2$
 $y - 2x = -1$ slope = 2
 NO (slopes are reciprocals, but not opposites)

- 2) $y = -x + 7$ slope = -1
 $y - x = 20$ slope = 1
 YES

- 3) $x = -1$ vertical line
 $y = 3$ horizontal line
 YES



- 4) $3x + 6y = 11$ slope = $-1/2$
 $6y = -3x + 11$ slope = $-\frac{1}{2}x + \frac{11}{6}$
 $y - 6 = 2(x + \frac{1}{2})$ (point slope form) slope = 2
 YES

- 5) $y + 3 = -3(x + 4)$ slope = -3
 $y = 3x - 5$ slope = 3
 NO

Factoring Review: 5 examples

SOLUTIONS

Quadratic Standard Form

$$Ax^2 + Bx + C$$

1) $25 - 16y^2$ (difference of squares) $a^2 - b^2 = (a + b)(a - b)$

$$\begin{aligned} a &= 5 \\ b &= 4y \end{aligned}$$

$$(5 + 4y)(5 - 4y)$$

2) $4t^2 - 13t - 12$ (divide and regroup)

$$AC = 4(-12) = -48$$

$$B = -13$$

What multiplies to -48 and adds to -13? 3 and -16

$$\begin{array}{r} -13t \\ \swarrow \quad \searrow \\ 4t^2 + + 3t - 12 \quad \text{divide} \\ (4t^2 - 16t) + (3t - 12) \quad \text{factor} \\ 4t(t - 4) + 3(t - 4) \quad \text{regroup} \end{array}$$

$$(4t + 3)(t - 4)$$

3) $2y^6 - 32y^2$ (GCF and difference of squares)

$$2y^2(y^4 - 16)$$

$$2y^2(y^2 + 4)(y^2 - 4)$$

$$2y^2(y^2 + 4)(y + 2)(y - 2)$$

4) $6x^2 + 9x - 12$

What multiplies to -72 and adds to 9? 9 and -8

$$A = 6$$

$$B = 9$$

$$C = -12$$

$$AC = -72$$

$$B = 9$$

$$6x^2 + 9x - 8x - 12 \quad \text{divide}$$

$$(6x^2 + 9x) + (-8x - 12) \quad \text{factor}$$

$$3x(2x + 3) + -4(2x + 3) \quad \text{regroup}$$

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

5) $y^3 - 2y^2 - y + 2$ (separate, factor, regroup)

$$y^3 - y - 2y^2 + 2$$

$$y(y^2 - 1) - 2(y^2 - 1)$$

$$(y - 2)(y^2 - 1) \quad \text{(difference of squares)}$$

$$(y - 2)(y + 1)(y - 1)$$

SOLUTIONS

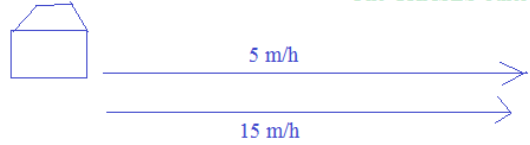
1) John leaves his house at 8:00 am, walking East at a speed of 5 miles/hour.
At noon, his brother leaves the house, and rides a bike in the same direction at 15 miles/hour.

a) What time do the brothers meet?

they meet at 2:00 pm

b) How far from home are they?

if $t = 6$, then $d = 30$ miles



distance = rate x time

John $d = 5 \text{ m/h } (t)$

brother $d = 15 \text{ m/h } (t - 4)$

When will the distances be the same?

$$5 \text{ m/h } (t) = 15 \text{ m/h } (t - 4)$$

$$5t = 15t - 60$$

$$t = 6$$

2) Train 1 and Train 2 are 300 miles apart.

At 9:00 am, Train 1 departs station A, heading North on the track at 60 mph.

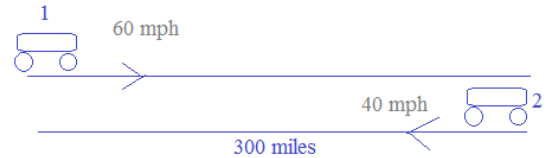
At 10:00 am, Train 2 departs station B, heading South on a parallel track at 40 mph.

a) When will the Trains pass each other?

12:24 pm

b) How far from station A are the trains when they meet?

the trains are 204 miles from station A



$$d_1 = 60 \text{ mph } (t)$$

$$d_2 = 40 \text{ mph } (t - 1)$$

because train 2 left one hour later

distance = rate x time

$$d_1 + d_2 = 300$$

$$60t + 40t - 40 = 300$$

$$100t = 340$$

$$t = 3.4 \text{ hours}$$

$$@ t = 3.4, d_1 = 204 \text{ miles}$$

$$d_2 = 96 \text{ miles..}$$

3.4 hours ----> 3 hours, 24 minutes

3) Trains 3 and 4 sit at station C. At noon, train 3 departs, going West at 60 m/h.

At 3:00 train 4 departs, going East at 70 m/h.

a) At 7:00, how far apart are the trains?

700 miles

train 3: distance = 60 m/h (7 hours) = 420 miles West

train 4: distance = 70 m/h (4 hours) = 280 miles East

trains are 700 miles apart...

b) When will the trains be 1200 miles apart?

10:51 pm

$$\text{distance of 3} + \text{distance of 4} = 1200 \text{ miles}$$

$$60 \text{ m/h } (\text{time}) + 70 \text{ m/h } (\text{time} - 3 \text{ hours}) = 1200 \text{ miles}$$

distance = rate x time

$$60t + 70t - 210 = 1200$$

$$130t = 1410$$

$$t = 10.846 \text{ hours... ----> 10 hours and 51 minutes}$$

- 4) A canoe goes up stream in 7 hours. Then, turns around and goes back downstream in 5 hours.
If the rowers can paddle 20 km/hour in still water,

a) What is the rate of the stream?

3 1/3 km/hour

$$\text{distance} = \text{rate} \times \text{time}$$

up stream $\text{distance} = (20 \text{ km/hr} - \text{rate of stream})(7 \text{ hours})$

down stream $\text{distance} = (20 \text{ km/hr} + \text{rate of stream})(5 \text{ hours})$

b) How far did the canoe travel?

233 1/3 km
(total up and down
the river)

since distances are the same, $140 \text{ km} - 7S = 100 \text{ km} + 5S$

$$40 = 12S$$

$$S = 3.33 \text{ km/hour}$$

If $S = 10/3 \text{ km/hour}$,

then $\text{distance} = (20 - 10/3)(7) = 116 \frac{2}{3} \text{ km}$

or $\text{distance} = (20 + 10/3)(5) = 116 \frac{2}{3} \text{ km}$

- 5) Bill can run 50 km in the same time that Joe can run 40 km.
If Bill runs 2 km/hour faster than Joe, what are their running rates?

$$\text{distance} = \text{rate} \times \text{time}$$

Bill $50 \text{ km} = (r + 2)(t)$

$$50 = rt + 2t$$

Joe $40 \text{ km} = (r)(t)$

$$40 = rt$$

Since $t = 5$, $r = 8$

Joe runs at 8 km/hour
Bill runs at 10 km/hour

$$50 = 40 + 2t$$

$$t = 5$$

- 6) Alex bikes at a rate of 12 miles per hour. Tim bikes at a rate of 10 miles per hour.
If Alex leaves school at 2:00 pm, and Tim leaves at 3:00 pm, when does Tim catch Alex?

$$\text{distance} = \text{rate} \times \text{time}$$

Alex: $\text{distance} = 12(t)$

If they meet, the distance will be the same..

Tim: $\text{distance} = 10(t - 1)$

$$12t = 10t - 10$$

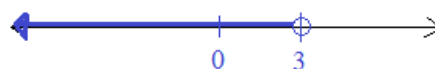
$t = -5$ Since time cannot be negative,
Tim never catches Alex!!

Specific Solution Sets

Find the solution set. Then, graph on a number line.

1) $4x - 3 < 9$ $x \in \{\text{Real Numbers}\}$

$4x < 12$
 $x < 3$ $\{x < 3\}$

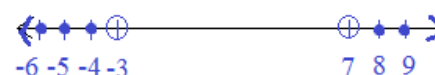


2) $|x - 2| > 5$ $x \in \{\text{Integers}\}$

find "critical values"
 $x - 2 = 5$ $x - 2 = -5$
 $x = 7$ $x = -3$

$-5: |-5 - 2| > 5$ ✓
 $0: |0 - 2| > 5$ ✗
 $10: |10 - 2| > 5$ ✓

$\{8, 9, 10, \dots\}$ and $\{-4, -5, -6, \dots\}$



"open circles"... then, test regions... → INTEGERS only!

3) $|x + 4| \leq 4$ $x \in \{\text{Integers}\}$

$x + 4 \leq 4$ and $x + 4 \geq -4$

$x \leq 0$ and $x \geq -8$
 AND an integer! $\{-8, -7, \dots, -2, -1, 0\}$



4) $2x + 7 < 18$ $x \in \{\text{Whole Numbers}\}$

$2x < 11$

$x < 5.5$ AND must be whole number
 $\{0, 1, 2, 3, 4, 5\}$



5) $|3 - 4x| < 9$ $x \in \{\text{Positive Numbers}\}$

$3 - 4x = 9$ $3 - 4x = -9$ test regions
 $-4x = 6$ $-4x = -12$ and eliminate negative
 $x = -3/2$ $x = 3$ numbers!
 (critical values) $\{0 < x < 3\}$



6) $\frac{(x + 2)(x - 5)}{(x + 1)} \leq 0$ $x \in \{\text{Real Numbers}\}$

critical values and asymptote:
 $-2, -1, 5$

test regions: -3 : negative
 -1.5 : positive
 0 : negative
 7 : positive

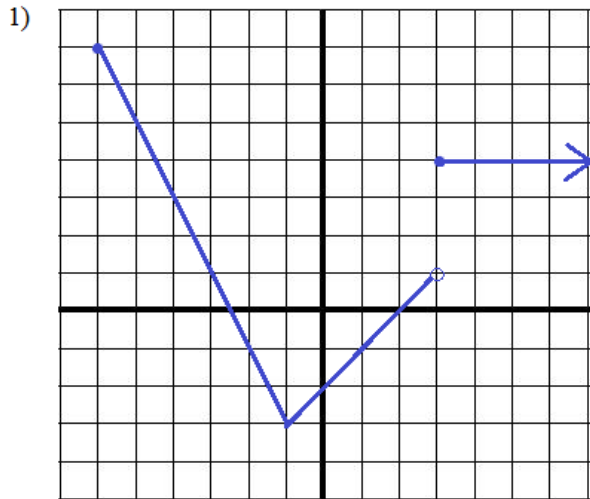


interval notation: $(-\infty, -2] \cup (-1, 5]$

SOLUTIONS

Piecewise Functions, Domain and Range

Find the domain and range. Then, write the equation.

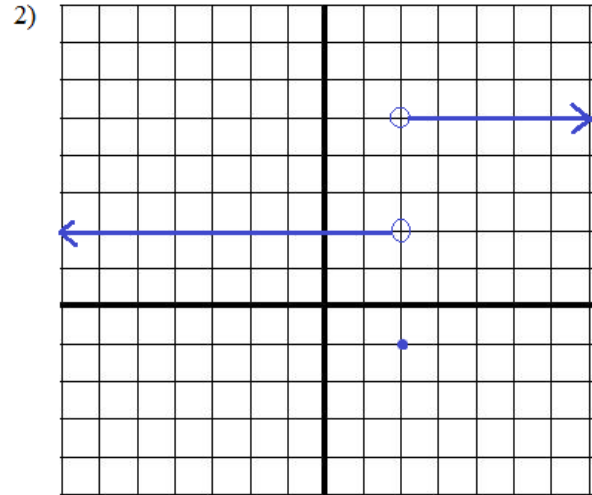


Domain: $[-6, \infty)$

Range: $[-3, 7]$

Function:

$$f(x) = \begin{cases} -2x - 5 & \text{if } -6 \leq x < -1 \\ x - 2 & \text{if } -1 \leq x < 3 \\ 4 & \text{if } x \geq 3 \end{cases}$$

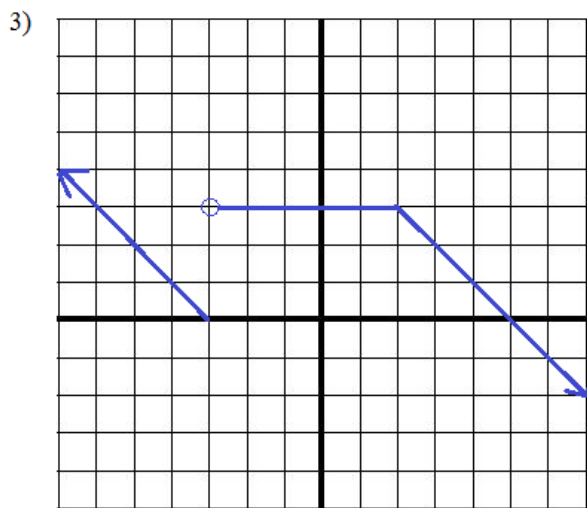


Domain: all real numbers $(-\infty, \infty)$

Range: $\{-1, 2, 5\}$

Function:

$$f(x) = \begin{cases} 2 & \text{if } x > 2 \\ -1 & \text{if } x = 2 \\ 5 & \text{if } x < 2 \end{cases}$$

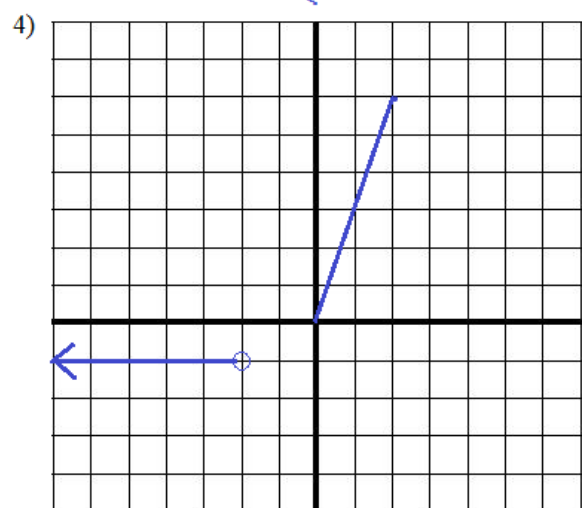


Domain: all real numbers $(-\infty, \infty)$

Range: all real numbers $(-\infty, \infty)$

Function:

$$f(x) = \begin{cases} -x - 3 & \text{if } x \leq -3 \\ 3 & \text{if } -3 < x < 2 \\ -x + 5 & \text{if } x \geq 2 \end{cases}$$



Domain: $(-\infty, -2) \cup [0, 2]$

Range: $\{x \mid 0 < x < 6, x = -1\}$

Function:

$$f(x) = \begin{cases} -1 & \text{if } x < -2 \\ 3x & \text{if } x \geq 0 \end{cases}$$

Algebra Graphing Review

1) John receives a \$60 gift card to the movie theater. If evening shows are \$10 and matinees are \$6, how many movie tickets can he afford? (graph the inequality)

Let $E = \#$ of evening shows $M = \#$ of matinee shows

The inequality is $\$6(M) + \$10(E) \leq \$60$
 money spent money spent
 on matinees on evening shows

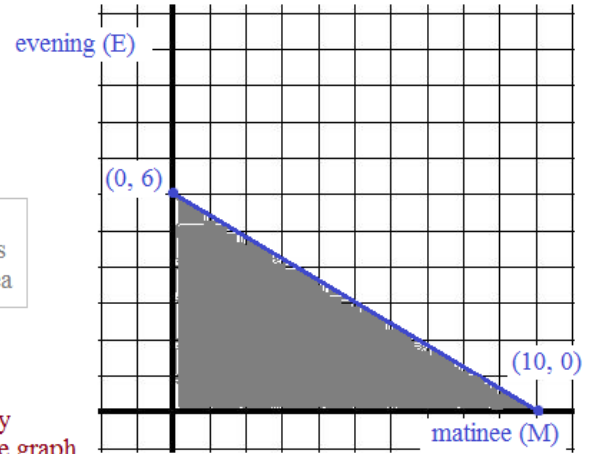
Since this is a linear equation, we can find 2 points and then draw a line through both points...

John can afford any combination of tickets in the gray shaded area

If John only goes to matinees: $(10, 0)$
 If John only goes to evening shows: $(0, 6)$

domain: $0 \leq M \leq 10$ (cannot have negative tickets)
 range: $0 \leq E \leq 6$

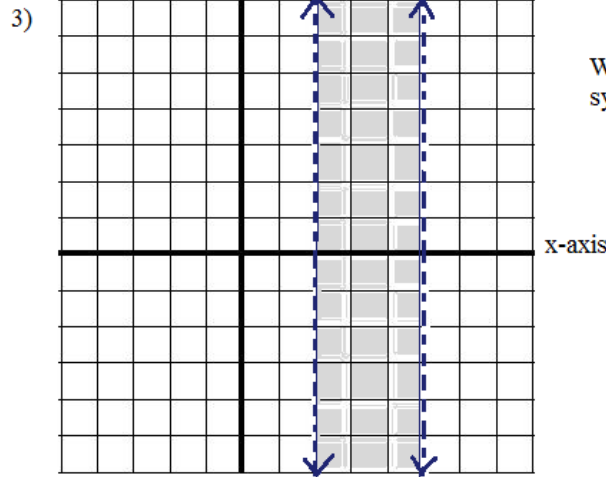
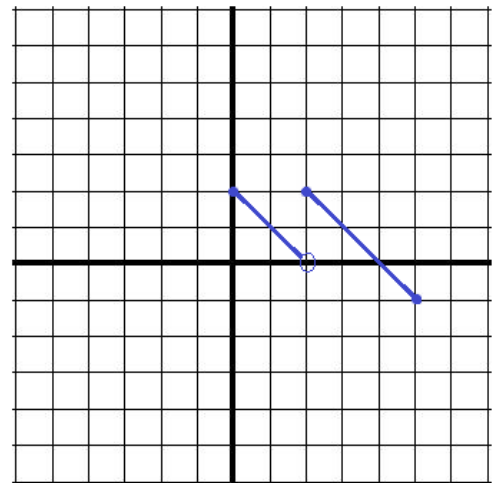
Note: we're assuming John can buy partial tickets... If he can't, then the graph would only consist of whole numbers.



$$2) \quad f(x) = \begin{cases} -x + 2 & \text{if } 0 \leq x < 2 \\ -x + 4 & \text{if } 2 \leq x \leq 5 \end{cases}$$

Graph the function (for the interval $[0, 5]$)

both parts of the piecewise function have the same slope (-1)



Write equations that describe the system of inequalities (on the left)

dashed lines: $<$ or $>$
 solid lines: \leq or \geq

the vertical line on the left: $x = 2$
 Since it's shaded on the right, the inequality is $x > 2$

the vertical line on the right: $x = 5$
 Since it's shaded on the left, the inequality is $x < 5$

The system of inequalities is the intersection:

$$2 < x < 5$$

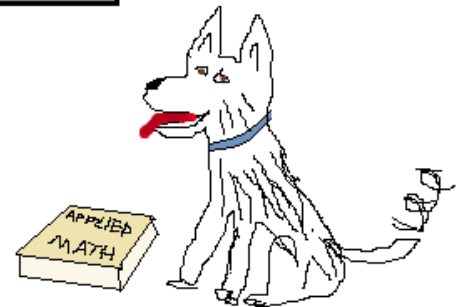
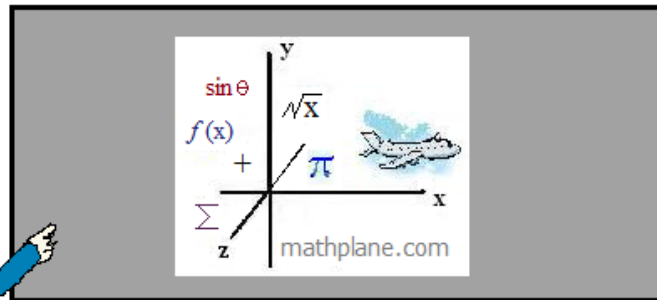
Thanks for visiting the site. (Hope it helped!)

Check out other Algebra Review exercises at mathplane.com.

If you have questions, suggestions, or requests, let us know.

Thanks!

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