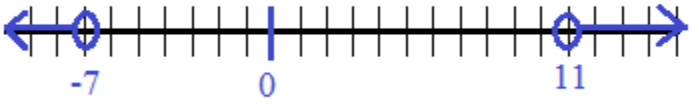
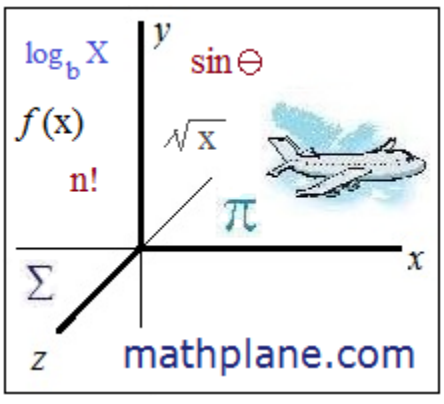
Algebra Review Test 1

(And, Solutions)



Topics include exponents, radicals, probability, factoring, word problems, linear systems, domain/range, graphing, and more.



Algebra Review Test

I. Exponents

(2 points each)
Solve and Simplify:

$9^{2} =$ $\quad 9^{-2} =$ $\quad 9^{1/2} =$ $\quad 9^{-1/2} =$

$\dfrac{14x^{2}y^{3}}{(2xy)^{2}} =$ $\quad \left(\dfrac{x^{2}}{y^{3}}\right)^{-3} =$ $\quad \left(\dfrac{3z^{2}}{y}\right)^{3} =$

$\left(\dfrac{2}{7}\right)^{-2} =$ $\quad 4^{3/2} =$

Radicals

(2 points each)
Solve and Simplify:

$\sqrt{72} =$ $\quad \sqrt{\dfrac{9}{16}} =$ $\quad \sqrt{12x^{3}y} =$

$\sqrt{2} + \sqrt{4} + \sqrt{6} + \sqrt{8} =$ $\quad \sqrt{5} \cdot \sqrt{20} =$ $\quad \sqrt{(ABC)^{2}} =$

**Extra Credit
(1 point each)

$\sqrt[3]{16} =$ $\quad (\sqrt{6} + \sqrt{2})(\sqrt{6} - \sqrt{2}) =$

Total Points _____
(30 possible
+ 2 bonus)

Algebra Review Test

II. Probability

A bag contains the following: 7 red marbles
8 blue marbles
5 green marbles

1) Find the following probabilities: a) p(picking 1 blue marble) =

(3 points each)

b) p(picking 2 green marbles) =

c) p(picking exactly 1 of each color) =
(i.e. picking 3 marbles 1b, 1g, 1r in any order)

d) p(picking 6 green marbles) =

2) "Replacement": Now, asume you draw 1 marble at a time AND you put it back in the bag. Find b), c), and d)

b) p(picking 2 green marbles) =

c) p(picking exactly 1 of each color) =

d) p(picking 6 green marbles) =

3) Solve the following: (assume a standard deck of 52 cards)

(2 points each) p(drawing a red card OR a king) =

p(drawing a red king) =

**Extra Credit:

(3 points) a) p(X) + p(not X) = ?

b) Give an example of each:

--- "mutually exclusive" and NOT "mutually exclusive"

--- "Independent" & "Dependent"

(Suggestion: consider flipping a coin or drawing cards as examples)

Total points _____
(25 possible
+ 3 bonus)

Algebra Review Test

III. Factoring

Factor the following: (1 point each)

$6x^3 - 3x$

$x^2 + 9$

$2x^2 - 12x + 16$

$x^2 - 9$

$m^2 - 2mn - 3n^2$

Solve the following: (3 points each)

$3x^2 - 27 = 0$

$x^2 + 14x = 9$

$x^2 - 12x + 27 = 0$

$2x^2 - 7x + 11 = 0$

IV. Word Problems

(3 points each)

1) 3 consecutive even integers add up to 312. What are they?

2) If Andy can read 200 pages in 3 hours. How many pages can he read in 8 hours? (Answer in fractional form)

3) John has 20 coins in his pocket. (dimes and quarters only) If he has $3.20, how many of each coin does he have?

**Extra Credit (2 points)

Bud can paint a fence in 4 hours. Lou can paint a fence in 3 hours. If they work together, how long would it take to paint 3 fences?

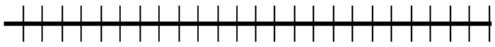
Total points _____
(26 possible + 2 bonus)

Algebra Review Test

V. Graphing (5 points each)

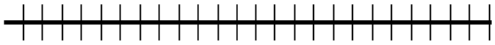
a) Graph on a number line

$-2 \leq x < 5$



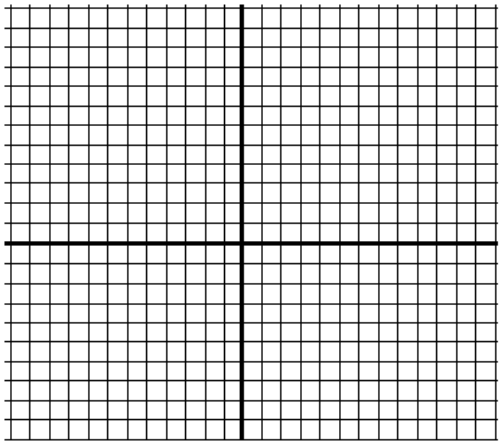
b) Solve and graph on a number line

$9 < |x - 2|$

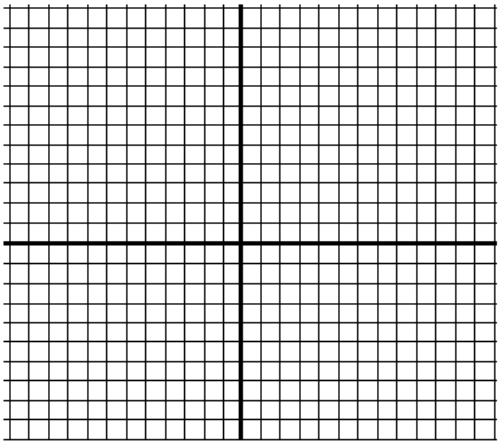


Graph on the coordinate plane:

c) $x = -3$



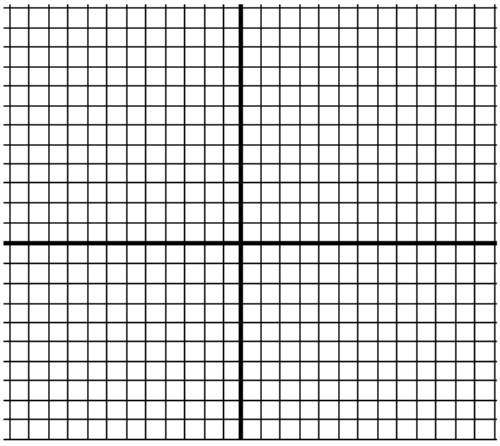
d) $y < 3x + 7$



**Extra credit
(2 points)

Graph the following quadratic:

$y \leq x^2 - 6x + 5$



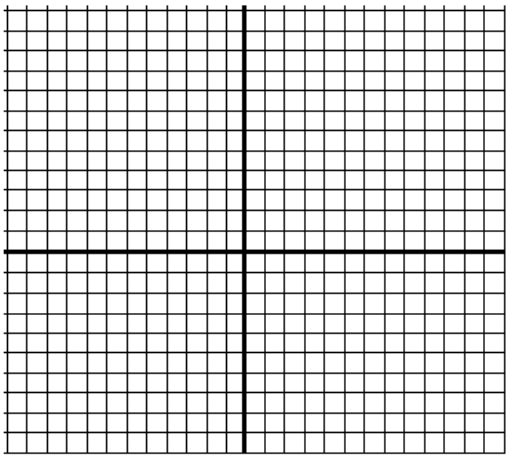
Algebra Review Test

VI. Linear Systems
(5 points each)

a) solve and graph the following system:

$3x + y = 12$

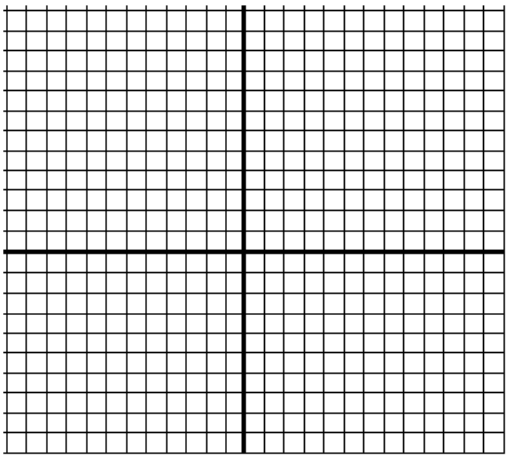
$4x - 3y = -10$



b) Graph the following linear system

$y < 3x + 6$

$y \geq -2x - 2$

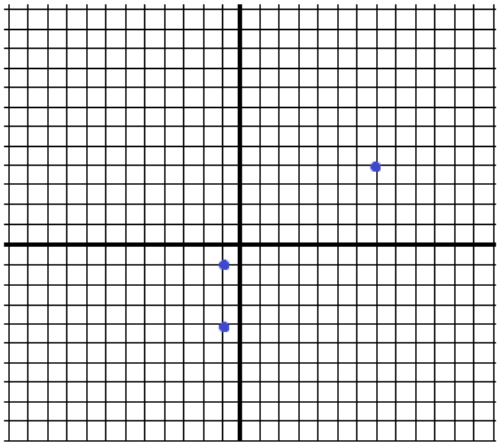


Algebra Review Test

VII. Slope and Lines

(3 points each)

A = (7, 4)
B = (-1, -4)
C = (-1, -1)



a) Find the slope of $\overline{AB}$

b) find the slope of $\overline{BC}$

c) What is the slope of a line perpendicular to $\overline{AC}$?

(4 points each)

d) Write the equation of a line going through points A and B in *slope intercept form* AND *standard form*

e) Write the equation for the line going through points B and C (in any linear form)

f) Is (-10, -15) on line $\overleftrightarrow{AB}$?

Total Points _____
(21 possible)

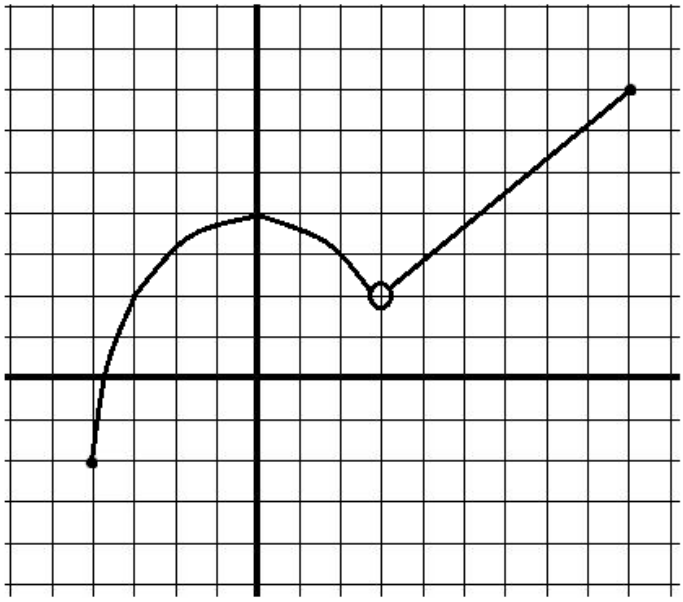
VIII. Domain and Range (3 points each)

1) Identify the domain of each:

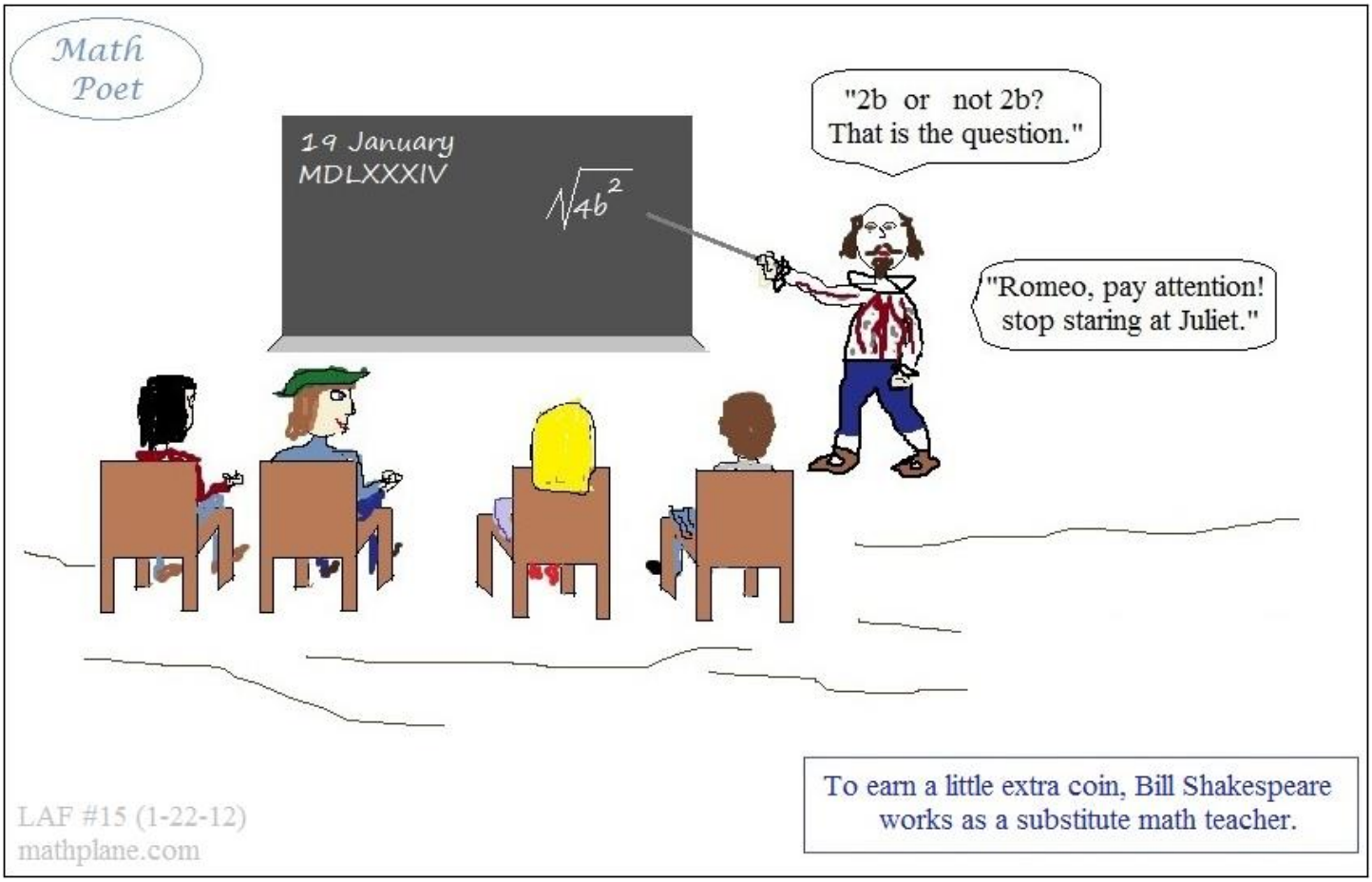
A) $f(x) = \sqrt{x} + \sqrt{6 - x}$

B) $y = \dfrac{3}{|x + 2| - 6}$

2) State the domain and range:



Total Points _____
(9 possible)


Math Poet
19 January
MDLXXXIV
$\sqrt{4b^2}$
"2b or not 2b? That is the question."
"Romeo, pay attention! stop staring at Juliet."
To earn a little extra coin, Bill Shakespeare works as a substitute math teacher.
LAF #15 (1-22-12)
mathplane.com

SOLUTIONS -→

Algebra Review Test

SOLUTIONS

I. Exponents

(2 points each)
Solve and Simplify:

$9^2 = 81$ $\quad 9^{-2} = \frac{1}{81}$ $\quad 9^{1/2} = 3$ $\quad 9^{-1/2} = \frac{1}{3}$

$\frac{14x^2y^3}{(2xy)^2} = \frac{14x^2y^3}{4x^2y^2} = \boxed{\frac{7y}{2}}$ $\quad \left(\frac{x^2}{y^3}\right)^{-3} = \frac{x^{-6}}{y^{-9}} = \boxed{\frac{y^9}{x^6}}$ $\quad \left(\frac{3z^2}{y}\right)^3 = \boxed{\frac{27z^6}{y^3}}$

$\left(\frac{2}{7}\right)^{-2} = \left(\frac{7}{2}\right)^2 = \boxed{\frac{49}{4}}$ $\quad 4^{3/2} = 4^1 \cdot 4^{1/2} = 4 \cdot 2 = \boxed{8}$

Radicals

$\sqrt{72} = 6\sqrt{2}$ $\quad \sqrt{\frac{9}{16}} = \frac{3}{4}$ $\quad \sqrt{12x^3y} = 2x\sqrt{3xy}$

(2 points each)
Solve and Simplify:

$\sqrt{2} + \sqrt{4} + \sqrt{6} + \sqrt{8} =$

$\sqrt{2} + 2 + \sqrt{6} + 2\sqrt{2} =$

$\boxed{2 + \sqrt{6} + 3\sqrt{2}}$

$\sqrt{5} \cdot \sqrt{20} =$

$\sqrt{100} = \boxed{10}$

$\sqrt{(ABC)^2} = ABC$

**Extra Credit
(1 point each)

$\sqrt[3]{16} =$

$\sqrt[3]{2 \cdot 8} = \boxed{2\sqrt[3]{2}}$

$(\sqrt{6} + \sqrt{2})(\sqrt{6} - \sqrt{2}) =$

(difference of squares)

or FOIL

$6 - \sqrt{12} + \sqrt{12} - 2 = \boxed{4}$

Total Points 32
(30 possible
+ 2 bonus)

II. Probability

Algebra Review Test

A bag contains the following: 7 red marbles
8 blue marbles
5 green marbles

SOLUTIONS

1) Find the following probabilities: (3 points each)

a) p(picking 1 blue marble) = $\frac{8}{20} = \frac{2}{5}$ or .4

b) p(picking 2 green marbles) = $\frac{5}{20} \cdot \frac{4}{19} = \frac{1}{19}$

probability = $\frac{\text{\# of "successes"}}{\text{\# of possibilities}}$

c) p(picking exactly 1 of each color) =
(i.e. picking 3 marbles 1b, 1g, 1r in any order)

B/R/G

$\frac{8 \cdot 7 \cdot 5}{20 \cdot 19 \cdot 18} = \frac{7}{171}$

6 orders: B/R/G B/G/R R/B/G R/G/B G/B/R G/R/B

$\frac{42}{171}$ for all 6 orders

d) p(picking 6 green marbles) =

ZERO!! (it's impossible)

2) "Replacement": Now, asume you draw 1 marble at a time AND you put it back in the bag. Find b), c), and d)

b) p(picking 2 green marbles) = $\frac{5}{20} \cdot \frac{5}{20} = \boxed{\frac{1}{16}}$

consider the 6 possibilities:
RBG RGB
BGR BRG
GRB GBR

c) p(picking exactly 1 of each color) =

$6 \cdot (7 \times 8 \times 5)$ → 20 x 20 x 20 possible ways to choose 3 marbles = 8000

1680 "successes"

$\frac{1680}{8000} = \boxed{\frac{21}{100}}$

d) p(picking 6 green marbles) =

$\left(\frac{5}{20}\right)^6 = \boxed{\frac{1}{4096}}$

3) Solve the following: (assume a standard deck of 52 cards) (2 points each)

p(drawing a red card OR a king) = $\frac{26}{52} + \frac{4}{52} - \frac{2}{52} = \frac{28}{52} = \boxed{\frac{7}{13}}$

diamonds + hearts + king of clubs + king of spades = 28 cards

p(drawing a red king) = $\frac{2}{52} = \boxed{\frac{1}{26}}$

King of hearts/King of diamonds

**Extra Credit: (3 points)

a) p(X) + p(not X) = ? 1

b) Give an example of each:

Mutually exclusive example: drawing a red card or a spade
NOT mutually exclusive example: drawing a red card or a king (king of hearts/diamonds would be 'double counted')

Independent Example: flipping a coin 3 times (because each coin flip is separate) --- "mutually exclusive" and NOT "mutually exclusive"

Dependent Example: drawing 3 cards WITHOUT replacement) --- "Independent" & "Dependent"

(Suggestion: consider flipping a coin or drawing cards as examples)

the first card can adjust probability of 2nd card

Total points 28
(25 possible + 3 bonus)

Algebra Review Test

www.mathplane.com

III. Factoring

Factor the following:

(1 point each)

$6x^3 - 3x$ — Greatest Common Factor: $3x(2x^2 - 1)$

$x^2 + 9$ — PRIME (cannot factor)

$2x^2 - 12x + 16$ — GCF: $2(x^2 - 6x + 8)$; $\boxed{2(x - 4)(x - 2)}$

$x^2 - 9$ — $(x + 3)(x - 3)$ Difference of Squares

$m^2 - 2mn - 3n^2$

$(m - 3n)(m + n)$

SOLUTIONS

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Solve the following:

(3 points each)

$3x^2 - 27 = 0$

$3(x^2 - 9) = 0$

$(x + 3)(x - 3) = 0$

$\boxed{x = 3, -3}$

$x^2 + 14x = 9$ $\quad x^2 + 14x - 9 = 0$

$$\frac{-14 \pm \sqrt{196 + 36}}{2} = \boxed{\begin{matrix} -7 + \sqrt{58} \\ \text{or} \\ -7 - \sqrt{58} \end{matrix}}$$

(use quadratic formula)

$x^2 - 12x + 27 = 0$

$(x - 9)(x - 3) = 0$

$\boxed{x = 3, 9}$

$2x^2 - 7x + 11 = 0$

$$\frac{7 \pm \sqrt{49 - 88}}{4}$$

No REAL solutions!
(*discriminant* is negative)

IV. Word Problems

(3 points each)

1) 3 consecutive even integers add up to 312. What are they?

Let x = 1st integer.. therefore, $x + (x + 2) + (x + 4) = 312$

$3x + 6 = 312$ $\quad 3x = 306$ $\quad x = 102$

$\boxed{102, 104, 106}$

2) If Andy can read 200 pages in 3 hours. How many pages can he read in 8 hours? (Answer in fractional form)

$$\frac{200 \text{ pages}}{3 \text{ hours}} = \frac{x \text{ pages}}{8 \text{ hours}}$$

cross multiply

$3x = 1600$

$\boxed{x = 1600/3 \text{ pages}}$

3) John has 20 coins in his pocket. (dimes and quarters only)
If he has $3.20, how many of each coin does he have?

let d = # of dimes
q = # of quarters

$d + q = 20$
$.10d + .25q = 3.20$

2 equations/2 unknowns
(use substitution to solve)

$.10(20 - q) + .25q = 3.20$
$2 - .1q + .25q = 3.2$
$.15q = 1.2$
$\boxed{q = 8}$

then, since $d + q = 20$, $\boxed{d = 12}$

**Extra Credit

(2 points)

Bud can paint a fence in 4 hours. Lou can paint a fence in 3 hours.
If they work together, how long would it take to paint 3 fences?

Bud's rate: 1 fence/4 hours
Lou's rate: 1 fence/3 hours

t = time

Bud Lou
$1 \text{ fence} = 1/4t + 1/3t$
$1 \text{ fence} = (3/12)t + (4/12)t = (7/12)t$
$t = 12/7$ hours

therefore, 3 fences would take 36/7 hours

approx 5 hours, 9 minutes

Total points 28
(26 possible + 2 bonus)

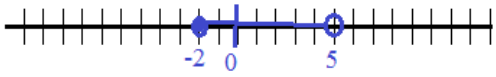
V. Graphing (5 points each)

SOLUTIONS

Algebra Review Test

a) Graph on a number line

$-2 \leq x < 5$

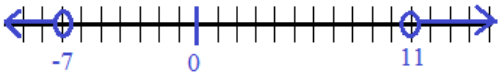


b) Solve and graph on a number line

$9 < |x - 2|$

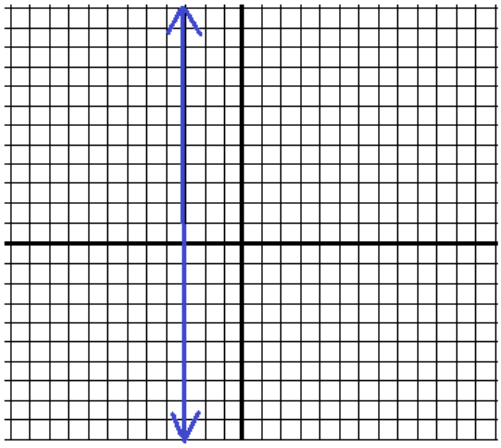
$9 < x - 2$ AND $x - 2 < -9$

$x > 11$ and $x < -7$



Graph on the coordinate plane:

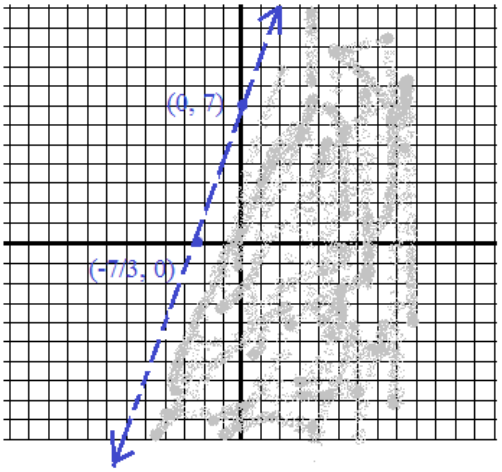
c) $x = -3$



d) $y < 3x + 7$

test (0, 0): $0 < 3(0) + 7$ ✓

(0, 0) is a point in the shaded region



**Extra credit
(2 points)

Graph the following quadratic:

$y \leq x^2 - 6x + 5$

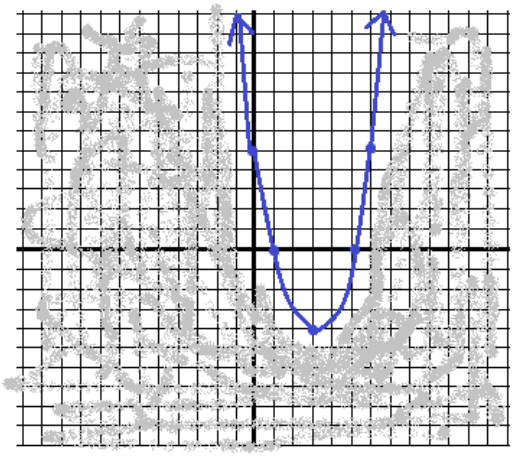
factor to find x-intercepts: $(x - 5)(x - 1) = 0$ (5, 0) and (1, 0)

then, find y-intercept: $0 - 6(0) + 5 = 5$ (0, 5)

axis of symmetry is between 1 and 5: $x = 3$

vertex is on axis of symmetry: (3, -4)

then, test points to determine where to shade...



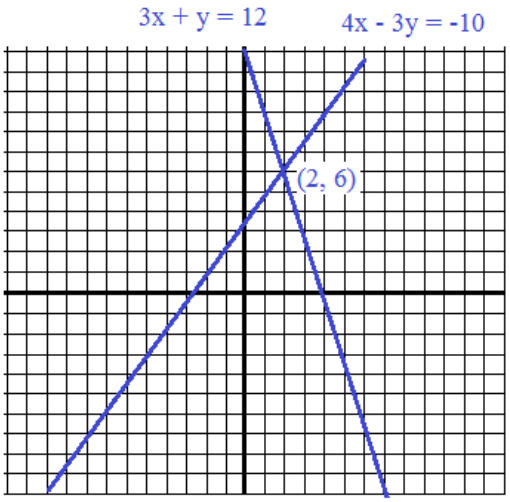
VI. Linear Systems

(5 points each)

a) solve and graph the following system:

$3x + y = 12$

$4x - 3y = -10$



(combination method)

$9x + 3y = 36$
$4x - 3y = -10$

$13x = 26$

$x = 2$

$3(2) + y = 12$

$y = 6$

(2, 6)

b) Graph the following linear system

$y < 3x + 6$

$y \geq -2x - 2$

$y = 3x + 6$

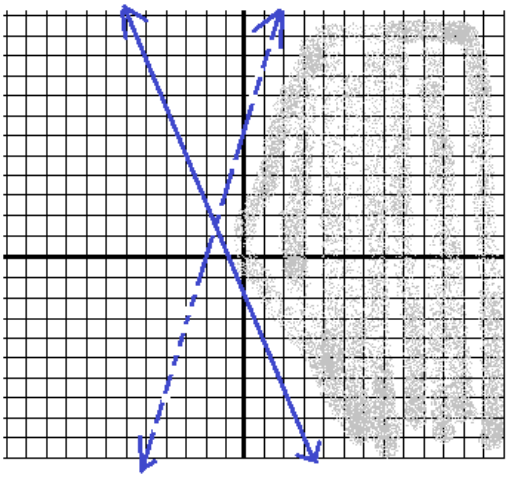
y-intercept: (0, 6)
x-intercept: (-2, 0)

since the inequality is <,
the line is dashed/dotted...

test (0, 0)...

$(0) < 3(0) + 6$

$0 < 6$... shade the right side...



$y = -2x - 2$

y-intercept: (0, -2)
x-intercept: (-1, 0)

since the inequality is $\geq$, the line is solid

test (0, 0)... $(0) \geq -2(0) - 2$

$0 \geq -2$ shade the right side of line..

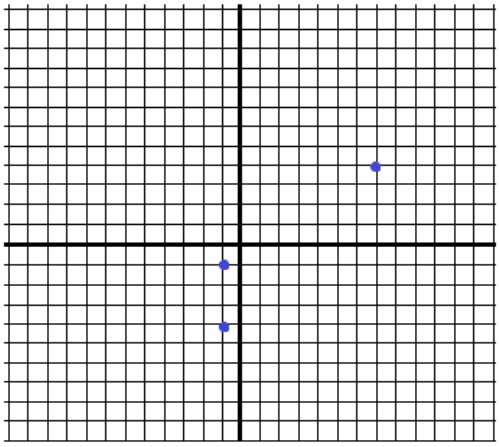
VII. Slope and Lines

SOLUTIONS

Algebra Review Test

(3 points each)

A = (7, 4)
B = (-1, -4)
C = (-1, -1)



a) Find the slope of $\overline{AB}$

slope = $\frac{\text{"rise"}}{\text{"run"}} = \frac{\triangle y}{\triangle x} = \frac{-1-7}{-4-4} = \frac{-8}{-8} = 1$

b) find the slope of $\overline{BC}$

$\frac{-4-(-1)}{-1-(-1)} = \frac{5}{0}$

undefined or "no slope"

c) What is the slope of a line perpendicular to $\overline{AC}$?

The slope of AC is $\frac{5}{8}$

therefore, the slope of a *perpendicular* line would be the *opposite reciprocal:* $\frac{-8}{5}$

(4 points each)

d) Write the equation of a line going through points A and B in *slope intercept form* AND *standard form*

(7, 4) and (-1, -4)

to find linear equation, we need slope and a point:

slope: 1

$y = mx + b$
$4 = (1)(7) + b$
$b = -3$

slope intercept form
$y = x - 3$

$y = x - 3$

$y + 3 = x$

standard form
$x - y = 3$

e) Write the equation for the line going through points B and C (in any linear form)

$x = -1$ (vertical line)

f) Is (-10, -15) on line $\overleftrightarrow{AB}$?

plug in the point to find out:

$y = x - 3$

$(-15) = (-10) - 3$

$-15 = -13$? NO

Total Points 21
(21 possible)

VIII. Domain and Range (3 points each)

Solutions

1) Identify the domain of each:

A) $f(x) = \sqrt{x} + \sqrt{6 - x}$

the domain consists of all numbers where there are NO negatives under the radicals.

answer: [0, 6]

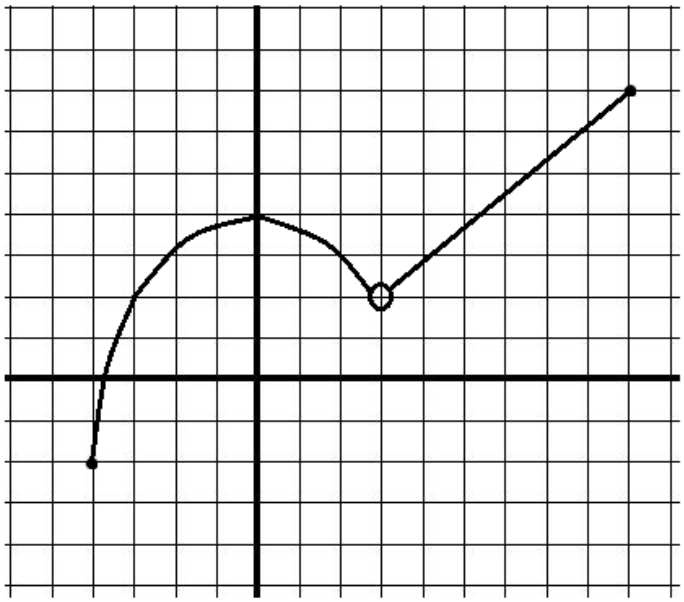
B) $y = \dfrac{3}{|x + 2| - 6}$

since the denominator cannot equal zero, find all numbers (x) where

$|x + 2| - 6 = 0$ x cannot be 4 or -8

Domain: all reals except -8 and 4

2) State the domain and range:



Domain: [-4, 3) U (3, 9]

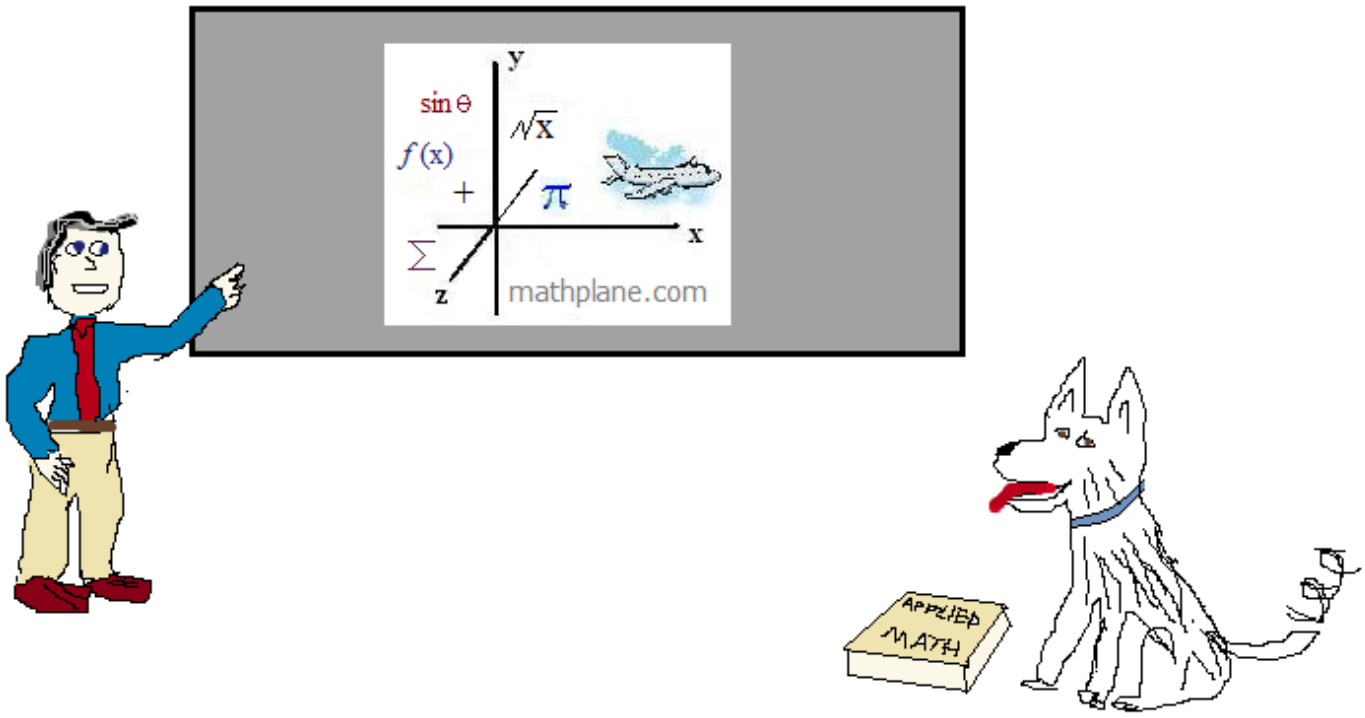
Range : [-2, 7]

Total Points (9 possible) 9

Thanks for visiting. (Hope it helps!)

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

Enjoy



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