

SHOW ALL WORK! (3 pts each)

1. Find the inverse of $f(x) = \frac{2}{3}x - 5$

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

$$x = \frac{2}{3}y - 5 \quad f^{-1}(x) = \frac{3}{2}(x+5)$$

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

2. If $f(x) = 3x - 2$ and $g(x) = 4x^2 - 3$, find $f(g(-2))$

$$f(g(-2)) = f(4(-2)^2 - 3)$$

$$= f(4(4) - 3)$$

$$= f(16 - 3)$$

$$= f(13) = 3(13) - 2 = 37$$

3. If $f(x) = 4x - 2$ and $g(x) = 3x^2 - 1$, find $f(x) * g(x)$

$$(4x - 2)(3x^2 - 1)$$

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

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

4. If $f(x) = x - 1$ and $g(x) = 3x^2 + 2$, find $g(f(x))$

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

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

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

$$= 3x^2 - 6x + 3 + 2$$

$$g(x) = 3x^2 - 6x + 5$$

5. What are the transformations used to obtain the graph of $y = |x + 2| - 3$ from the parent function $y = |x|$.

left 2 + up 3

6. Set up a system of equations and solve. The perimeter of a rectangle is 94 cm. The length of the rectangle is one less than three times the width. Find the dimensions.

$$P = 2L + 2w \quad 96 = 8w$$

$$94 = 2L + 2w \quad 12 = w$$

$$L = 3w - 1 \quad L = 3(12) - 1$$

$$94 = 2(3w - 1) + 2w \quad L = 35 \text{ cm}$$

$$94 = 6w - 2 + 2w \quad 35 \text{ cm} \times 12 \text{ cm}$$

$$94 = 8w - 2$$

7. Set up a system of equations and solve. Kate has 45 coins in his piggy bank. If the coins are all quarters and dimes and their total is \$8.70, how many of each does she have?

$$q + d = 45 \quad \# \text{ of coins}$$

$$.25q + .10d = 8.70 \quad \text{value of coins}$$

$$-10q - 10d = -4.50$$

$$.25q + .10d = 8.70$$

$$-.15q = 4.20$$

$$\frac{-15q}{-15} = \frac{4.20}{.15} \quad 28 \text{ quarters}$$

$$q = 28 \quad + 17 \text{ dimes}$$

$$28 + d = 45 \quad d = 17$$

8. Write a piecewise function. A T-shirt printing company is going to charge HHS \$10 per shirt for the first 75 graduation t-shirts. If the school buys more than 75, the company reduces the price to \$8 per shirt. Express y, the total cost in dollars, as a piecewise function of x, the number of shirts ordered.

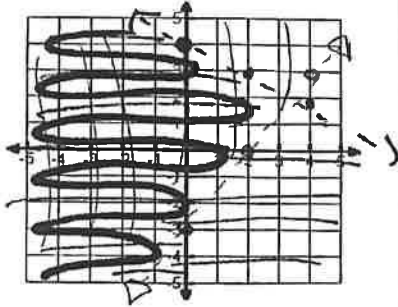
$$y = \begin{cases} 10x & 0 \leq x \leq 75 \\ 8x & x > 75 \end{cases}$$

9. Graph the system of inequalities.

$$\begin{aligned} 3x - 2y &< 6 \\ x + 2y &< 8 \end{aligned}$$

$$y > \frac{3}{2}x - 3$$

$$y < -\frac{1}{2}x + 4$$

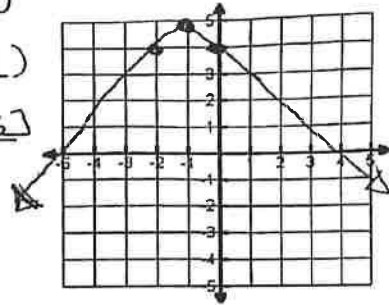


10. Graph $y = -|x + 1| + 5$

Vertex $(-1, 5)$

Domain $(-\infty, \infty)$

Range $(-\infty, 5]$



11. Solve and graph the solution on a number line

$$\frac{2}{3}|x - 1| + 2 < 6$$

$$\frac{3}{2} \cdot \frac{2}{3}|x - 1| < 4 - \frac{3}{2}$$

$$|x - 1| < 6$$

$$x - 1 > -6 \quad \text{and}$$

$$+1 \quad +1$$

$$x > -5$$

$$x > -5$$

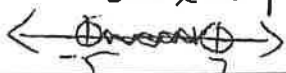
$$x - 1 < 6$$

$$+1 \quad +1$$

$$x < 7$$

$$x < 7 \quad \text{OR}$$

$$-5 < x < 7 \quad (\text{open})$$



12. Solve and graph the solution on a number line

$$-2|x + 3| + 2 < -10$$

$$\frac{-2|x + 3|}{-2} < \frac{-12}{-2}$$

$$|x + 3| > 6$$

$$x + 3 > 6 \quad \text{OR} \quad x + 3 < -6$$

$$-3 \quad -3$$

$$-3 \quad -3$$

$$x > 3$$

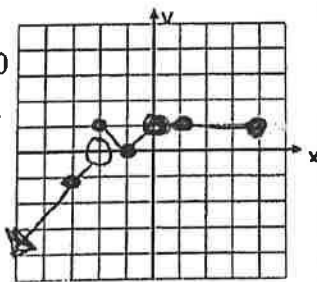
$$\text{OR}$$

$$x < -9$$



13. Graph the following piece-wise function. State domain and range.

$$f(x) = \begin{cases} x+2 & \text{if } x < -2 \\ |x+1| & \text{if } -2 \leq x < 0 \\ 1 & \text{if } 0 \leq x \leq 4 \end{cases}$$



Domain: $(-\infty, 4]$

Range: $(-\infty, -1]$

x	y
-3	-3+2 = -1
-2	-2+2 = 0 open
-2	-2+1 = -1 closed
-1	-1+1 = 0
0	0+1 = 1 open
0	1 closed
1	1
4	1

14. Solve by SUBSTITUTION!

$$\begin{cases} x - 9y = 25 \\ 6x - 5y = 3 \end{cases}$$

$$x = 9y + 25$$

$$6(9y + 25) - 5y = 3$$

$$54y + 150 - 5y = 3$$

$$(-2, -3)$$

$$\frac{49y}{49} = \frac{-147}{49}$$

$$y = -3$$

$$x = 9(-3) + 25$$

$$x = -27 + 25$$

$$x = -2$$

Math 3 Unit 1: Functions and Their Inverses

Multiple Choice:

- 1) What is the equation for the inverse of the function $y = 4x - 5$?
 (A) $y = 4x + 5$ (B) $y = -4x + 5$
 (C) $y = \frac{1}{4}x - \frac{5}{4}$ (D) $y = \frac{1}{4}x + \frac{5}{4}$

- 2) If $f(x) = -3x + 1$ and $g(x) = 2x^2$, which is the function $(f \circ g)(x)$?
 (A) $(-3x+1)(2x^2)$
 (B) $6x^2 + 1$
 (C) $2(-3x+1)^2$
 (D) $-2(1-3x)^2$

- 3) If $(f \circ g)(x) = 2x - 1$, how might $f(x)$ and $g(x)$ be defined?

- (A) $f(x) = x - 1$ and $g(x) = 2x - 1$
 (B) $f(x) = x - 1$ and $g(x) = 2x + 1$
 (C) $f(x) = 2x - 1$ and $g(x) = x - 1$
 (D) $f(x) = 2x + 1$ and $g(x) = x - 1$

$f(g(x))$
 $f(2x^2)$
 $-3(2x^2) + 1$
 $-6x^2 + 1$

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

- 4) Solve the system $4x - 3y = 8$ and $6x - 6y = 16$. Which statement is true?

- (A) The solution is $(2, 0)$. (B) There is NO solution. (C) There are infinitely many solutions.

- 5) Pick which ordered pair is a solution of the system of linear equations.

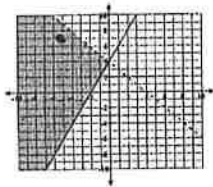
$3x - 2y = 11$
 $-x + 8y = 7$

- A. $(7, 5)$ B. $(1, -4)$ C. $(11, 3)$ D. $(5, 2)$

- 6) For $f(x) = 5x + 1$, find $f(-4)$.

- A. -19 B. 1 C. -21 D. 21

- 7) From looking at the graphs below, what is a solution to the system?



- (A) $(-2, 6)$
 (B) $(-3, 7)$
 (C) $(2, 2)$
 (D) $(0, 5)$

- 8) Which constant could you multiply one of the equations in this system by to solve by elimination easily?

$3x + 5y = 7$
 $-2x + y = 8$

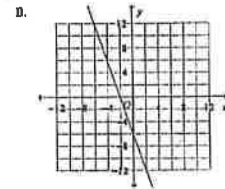
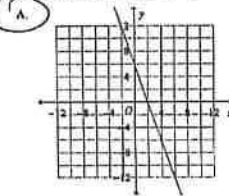
or

- (A) 3 (B) -5 (C) -1 (D) 2

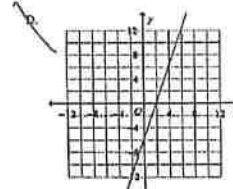
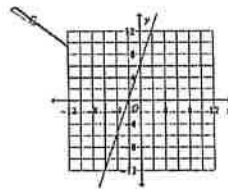
- 9) Which point satisfies the system $y = x + 3$ and $y = 5 - x^2$?

- A. $(4, -1)$ B. $(-1, 2)$ C. $(2, 1)$ D. $(-2, 1)$

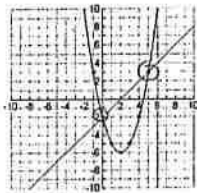
- 10) Graph the equation $-3x - y = 6$.



$y = -3x + 6$



11) From looking at the graph below, what is (are) the solution(s) to the system?

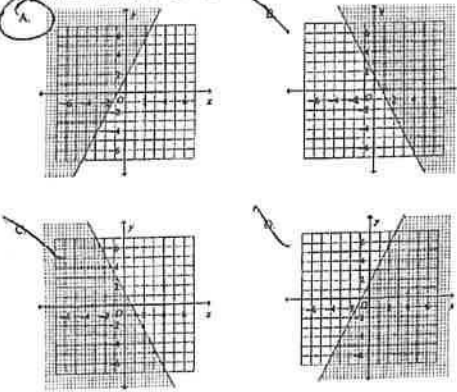


- A. (5,3) B. (2,-6) C. (5,3) and (-1,3) D. (3,3) and (0,-2)

12) The equations $5x + 2y = 48$ and $3x + 2y = 32$ represent the money collected from school concert ticket sales during two class periods. If x represents the cost for each adult ticket and y represents the cost for each student ticket, what is the cost for each adult ticket?

- A. 4 B. 9 C. 20 D. 10

13) Graph the inequality $4x - 2y < -3$.



$$\begin{aligned} 5x + 2y &= 48 \\ -3x - 2y &= -32 \\ \hline 2x &= 16 \\ x &= 8 \end{aligned}$$

$y > 2x + \frac{3}{2}$
neg. slope
below

14) Evaluate the piecewise function for the given value of the domain. $f(x) = \begin{cases} 3x+1 & \text{if } x < -1 \\ -2x+5 & \text{if } x \geq -1 \end{cases}$

Find $f(2)$.
 $-2(2) + 5 = 1$
 A. -9 B. -8 C. 1 D. 7

15) Which set of points is in the solution set for the system of inequalities: $x - y > 1$ and $y < 2x - 1$?

- A. (-1, -1) B. (-2, -1) C. (-1, 0) D. (0, -2)

16) Determine which of the following relations are functions. Circle your answer.



Is it a function? (circle one):
 Yes No Yes No

17) From 1840 to 1990 the percent of the labor force in farming and non-farming occupations can be modeled by the equations $y = -0.48t + 67.2$ where $t = 0$ represents 1840. In what year was the labor force split equally into farming and non-farming occupations? Round your answer to the nearest year.

$$\begin{aligned} -0.48t + 67.2 &= 32.9 \\ -0.48t &= -34.3 \\ t &= \frac{-34.3}{-0.48} \approx 71.46 \end{aligned}$$

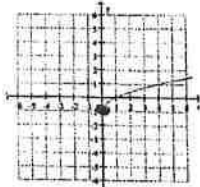
1840 + 71.46 = 1911.46

A. 1876 B. 1890 C. 1976 D. never

18) Which of the following best describes the transformations used to obtain the graph of $y = -\frac{1}{2}|x+3| + 3$ from the parent function $y = |x|$?

- A. reflect across the x-axis, shift right one unit and down three units
 B. reflect across the x-axis, shift left one unit and down three units
 C. reflect across the y-axis, shift left one unit and up three units
 D. reflect across the y-axis, shift right one unit and down three units

19) Use the graph to determine the functions domain and range.



- A) Domain $[0, \infty)$ Range $(-\infty, \infty)$
 B) Domain $(-\infty, \infty)$ Range $[-1, \infty)$
 C) Domain $(0, \infty)$ Range $(-1, \infty)$
 D) Domain $[0, \infty)$ Range $[0, \infty)$

$(0, -1)$ min. point

20. Solve $|3x + 5| = 1$

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

c. $x = 2$ or $x = -2$

b. $x = 2$ or $x = -1$

d. $x = -\frac{1}{3}$ or $x = -2$

$3x + 5 = -1$
 $3x = -6$
 $x = -2$

or $3x + 5 = 1$
 $3x = -4$
 $x = -\frac{4}{3}$

Free Response:

- 1) Given:
 $f(x) = 2x + 1$
 $g(x) = 15x^2$
 $h(x) = 5$
 $b(x) = x^2 + 3x - 10$
 $c(x) = 4x$
 $j(x) = 3\sqrt{2x - 1} + 4$

Find each of the following

$f(7x)$ $2(7x) + 1$ $14x + 1$	$h(-10)$ 5	$(b+c)(x)$ $x^2 + 3x - 10$ $+ 4x$ $x^2 + 7x - 10$	$(\frac{g}{h})(x) = \frac{15x^2}{5}$ $3x^2$	$f(g(x))$ $2(15x^2) + 1$ $30x^2 + 1$
$f'(x)$ $\frac{x-1}{2}$	$g(c(2))$ $g(4(2))$ $g(8)$ $15(8)^2$	$b(x) - c(x)$ $x^2 + 3x - 10$ $- 4x$ $x^2 - x - 10$	$g^3(x)$ $\sqrt{\frac{x}{15}}$	$j^3(x)$ $(\frac{x-4}{3})^3$

2) Given the linear equation $5x + 2y = 10$. Put into slope intercept form. Then find the slope and y-intercept.

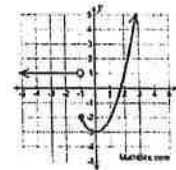
$2y = -5x + 10$
 $\frac{2y}{2} = \frac{-5x + 10}{2}$

Slope Intercept Form
 $y = -\frac{5}{2}x + 5$

Slope
 $-\frac{5}{2}$

Y-intercept
 $(0, 5)$

3) Use the following piecewise function graph to answer the questions below.



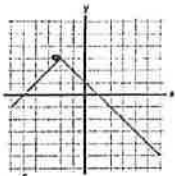
$f(2) = -2$

$f(-1) = -2$

$f(-2) = 1$

$x = 1$ find y
 $x = -1$ find y
 (at not the hole)
 $x = -2$ find y

- 4) Given the graph of the function, $g(x)$, below, identify the domain, range, and how it is translated from $f(x) = |x|$.



vertex $(-2, 3)$

Domain: $(-\infty, \infty)$

Range: $(-\infty, 3]$

Translation from $f(x)$: reflect over x -axis, left 2 + up 3

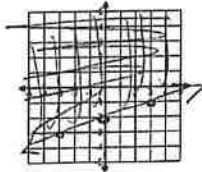
Equation of $g(x)$: $y = -|x+2| + 3$

5. Graph the following inequality: $2x - 6y \leq 12$

$$y \geq \frac{1}{3}x - 2$$

State the slope: $\frac{1}{3}$

State the y -intercept: $(0, -2)$



6. Solve using any method. Jacob has 34 coins in his piggy bank. If the coins are all quarters and dimes and their total is \$6.55, how many quarters and dimes are in the bank?

A) Write two equations to represent this situation.

B) Solution: $q + d = 34$

$$.25q + .10d = 6.55$$

$$-.10q - .10d = -3.40$$

$$.25q + .10d = 6.55$$

$$\frac{.15q}{.5} = \frac{3.15}{.5}$$

$$q = 21$$

$$21 + d = 34$$

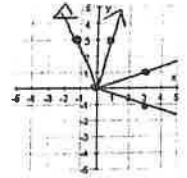
$$-21 \quad -21$$

$$d = 13$$

21 quarters
+
13 dimes

7. Refer to the graph. Is the given graph a function? How do you know?

no. doesn't pass vertical line test



- Is the inverse of the given graph a function? How do you know?

yes will pass vertical line test

Draw the graph of the inverse on the same axes.

8. The points $(9, 13)$ and $(-4, 10)$ are on $p(x)$. Name 2 points on $p^{-1}(x)$.

$(13, 9)$ & $(10, -4)$

switch x & y

9. Is it always true that $f(g(x)) = g(f(x))$? If yes, state why. If no, give an example where it's not true.

no only true if f & g are inverses

10. Evaluate each of the following for function g (the graph shown). If you use the graph, no work needs to be shown. Else, show your calculation. If it is impossible to evaluate, explain why not.

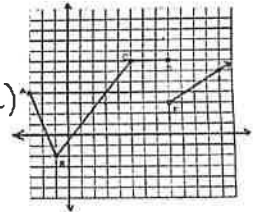
a. $g(3) = 4$

b. $g(-1) = -2$

c. $g(-3) = \text{undefined (hole)}$

d. $g(8) = 7$

e. $g(40) = 26$

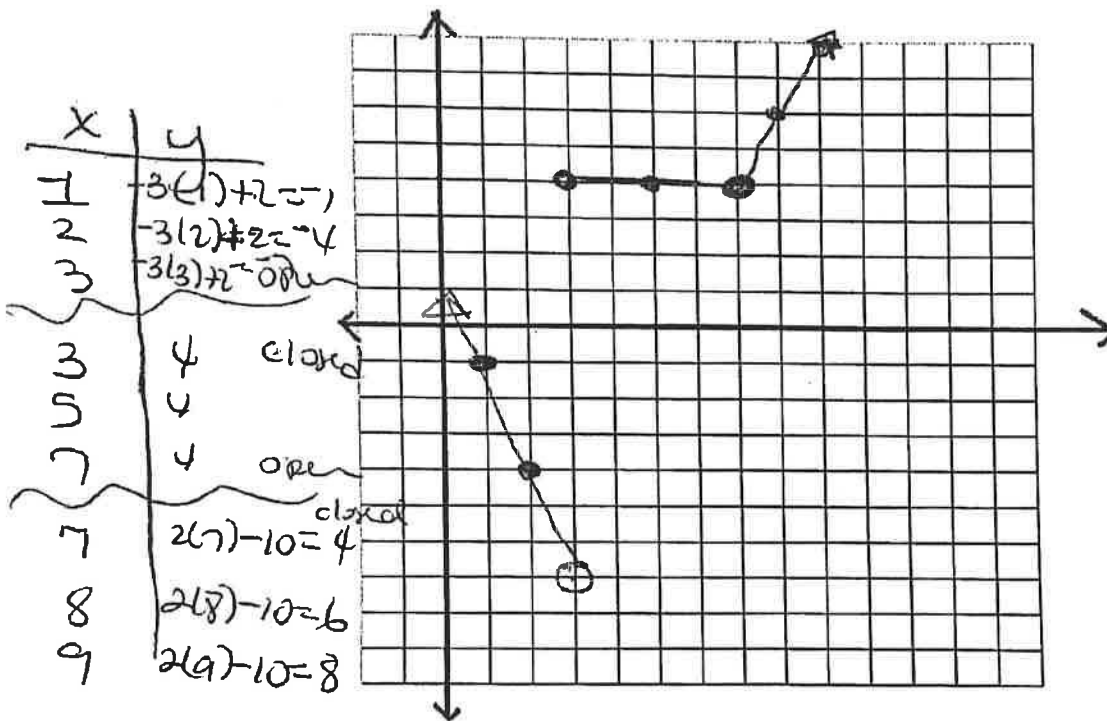


$$\frac{3}{4}(40 - 8) + 2$$

$$\frac{3}{4}(32) + 2 = 26$$

11. Graph the following piecewise function in the space provided. Make sure that you clearly erase all parts of the line that do not belong in the final graph.

$$h(x) = \begin{cases} -3x+2, & x < 3 \\ 4, & 3 \leq x < 7 \\ 2x-10, & x \geq 7 \end{cases}$$



Show All work!

<p>1) Simplify and Classify by degree and number of terms. A. $(-8d^3 - 7) - (-d^3 - d^2 - 6)$</p> $-8d^3 - 7 + d^3 + d^2 + 6$ $-7d^3 + d^2 - 1$ <p>B. $x(x-3) - 2x(x-3)$ <i>Cubic Tr.</i></p> $x^2 - 3x - 2x^2 + 6x$ $-x^2 + 3x$ <i>Quad B.</i>	<p>2) Write a polynomial function in <u>standard form</u> with the roots $0, \frac{-2}{5}, 3$</p> $y = x(x-3)(5x+2)$ $y = x(5x^2 - 13x - 6)$ $y = 5x^3 - 13x^2 - 6x$
<p>3) Solve to find all the roots. $x^3 - 64 = 0$</p> $(x-4)(x^2 + 4x + 16) = 0$ <p>$x = 4$ $x^2 + 4x + 16 = -16 + 16$</p> $(x+2)^2 = -12$ $x+2 = \pm 2i\sqrt{3}$ $-2 \pm 2i\sqrt{3}$	<p>4) Solve to find all the roots. $8x^3 - 1 = 0$</p> $(2x-1)(4x^2 + 2x + 1) = 0$ $x = \frac{1}{2}$ $x = \frac{-2 \pm \sqrt{4 - 4(4)(1)}}{2(4)}$ $x = \frac{-2 \pm 2i\sqrt{3}}{8}$ $x = \frac{-1 \pm i\sqrt{3}}{4}$
<p>5) Divide using synthetic division. $(x^4 - 6x^2 - 27) \div (x+2)$</p> $\begin{array}{r rrrrr} -2 & 1 & 0 & -6 & 0 & -27 \\ & & -2 & 4 & 4 & -8 \\ \hline & 1 & -2 & -2 & 4 & -35 \end{array}$ $x^3 - 2x^2 - 2x + 4 \frac{-35}{x+2}$	<p>6) Divide using long division. $(7x^3 + 11x^2 + 7x + 5) \div (x^2 + 1) = 7x + 11$</p> $\begin{array}{r} x^2 + 1 \overline{) 7x^3 + 11x^2 + 7x + 5} \\ \underline{-7x^3 + 7x} \\ 11x^2 + 5 \\ \underline{-11x^2 - 11} \\ -6 \end{array}$

Solve to find all zeros.

$$f(x) = x^3 - 6x^2 + 4x + 16$$

$\{4, 1 \pm \sqrt{5}\}$

$$\begin{array}{r} 4 \mid 1 \quad -6 \quad 4 \quad 16 \\ \downarrow \quad 4 \quad -8 \quad 16 \\ \hline 1 \quad -2 \quad -4 \quad 0 \end{array}$$

$$x^2 - 2x - 4 = 0$$

$$x^2 - 2x + \square = 4 + \square$$

$$\sqrt{(x-1)^2} = \sqrt{5}$$

$$x-1 = \pm \sqrt{5}$$

8) Solve to find all zeros.

$$f(x) = x^3 - 9x^2 + 28x - 30$$

$\{3, 3 \pm i\}$

$$\begin{array}{r} 3 \mid 1 \quad -9 \quad 28 \quad -30 \\ \downarrow \quad 3 \quad -18 \quad 30 \\ \hline 1 \quad -6 \quad 10 \quad 0 \end{array}$$

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

$$x^2 - 6x + 9 = -10 + 9$$

$$(x-3)^2 = -1$$

$$x = 3 \pm i$$

9) You want to make an open top box from cardboard. The original cardboard is 20 X 30. Find the maximum volume and the length of the cut. Round to the nearest hundredth.

$$V = x(20-2x)(30-2x)$$

Length 3.92

Max Vol. 1056.31

10) Is $(x+3)$ a factor of

$6x^3 + 25x^2 + 15x - 15 = 0$? If so, find the remaining factors.

$$\begin{array}{r} +3 \mid 1 \quad -4 \quad 15 \quad 6 \\ \quad \quad 3 \quad -3 \quad -6 \\ \hline 1 \quad -1 \quad -2 \quad 0 \end{array}$$

$$x^2 - x - 2$$

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

11) Solve: $x^4 - 12x^2 - 64 = 0$

$$x^2 - 16 \quad x^2 + 4$$

$$x = \pm 4 \quad x = \pm 2i$$

1.64
2.32
9.16

12) Solve: $x^4 - x^2 - 72 = 0$

$$x^2 - 9 \quad x^2 + 8$$

$$\pm 3 \quad \pm 2\sqrt{2}$$

13) Find the discriminant and describe the roots of $3x^2 + 2x - 8 = 0$

$$2^2 - 4(3)(-8)$$

$$4 + 96$$

100

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

$$(-2)^2 - 4(1)(7)$$

$$4 - 28$$

2 Real
2 Imag.

14) Solve by completing the square $x^2 - 6x - 15 = 0$

$$x^2 - 6x + 9 = 15 + 9$$

$$(x-3)^2 = 24$$

$$x-3 = \pm 2\sqrt{6}$$

$$3 \pm 2\sqrt{6}$$

I. Free Response – Must show all work! (3pts each)

1. Simplify and Classify by degree and number of terms
 $3x(x-2) - (x^2 - 2x - 1)$
 $3x^2 - 6x - x^2 + 2x + 1$ Quad
 $2x^2 - 4x + 1$ Tri

2. Simplify and Classify by Degree and number of terms:
 $x(x-3) - x(x+2)$
 $x^2 - 3x - x^2 - 2x$
 $-5x$ Lin.
 Mono.

3. Divide using long division: $(x^3 - 6x + 1) \div (x - 2)$

$$\begin{array}{r} x^2 + 2x - 2 \\ x-2 \overline{) x^3 + 0x^2 - 6x + 1} \\ \underline{-x^3 + 2x^2} \\ 2x^2 - 6x \\ \underline{-2x^2 + 4x} \\ -2x + 1 \\ \underline{-2x + 4} \\ -3 \end{array}$$

4. Divide using synthetic division:
 $(x^4 - 3x^2 - 5x - 7) \div (x - 2)$

$$\begin{array}{r|rrrrrr} 2 & 1 & 0 & -3 & -5 & -7 \\ & & 2 & 4 & 2 & -6 \\ \hline & 1 & 2 & 1 & -3 & -13 \end{array}$$

 $x^3 + 2x^2 + 1x - 3$ $\frac{-13}{x-2}$

5. Solve: $x^4 - 4x - 32 = 0$
 $(x^2 - 8)(x^2 + 4) = 0$
 $x = \pm 2\sqrt{2}$ $x = \pm 2i$

6. Write a polynomial function in standard form with the given zeros: $x = 0, 3, -1/5$
 $x=0$ $x=3$ $x=-1/5$
 $y = x(x-3)(5x+1)$
 $y = x(5x^2 - 14x - 3)$
 $y = 5x^3 - 14x^2 - 3x$

7. Solve: $27x^3 - 1 = 0$
 $(3x-1)(9x^2 + 3x + 1) = 0$
 $x = \frac{1}{3}$
 $x = \frac{-3 \pm \sqrt{3^2 - 4(9)(1)}}{2(9)}$
 $x = \frac{-3 \pm \sqrt{-27}}{18}$

8. Find all the zeros: $x^3 - 6x^2 + 4x + 16 = 0$
 $\{ 4, 1 \pm \sqrt{5} \}$

$$\begin{array}{r|rrrr} 4 & 1 & -6 & 4 & 16 \\ & & 4 & -8 & -16 \\ \hline & 1 & -2 & -4 & 0 \end{array}$$

 $x^2 - 2x - 4 = 0$
 $x^2 - 2x + 1 = 4 + 1$
 $(x-1)^2 = 5$
 $x = 1 \pm \sqrt{5}$

$\frac{-1 \pm i\sqrt{3}}{6}$ $x = \frac{-3 \pm 3i\sqrt{3}}{18}$

9. Solve to find all the zeros:
 $f(x) = x^3 - 9x^2 + 28x - 30$

$\{3, 3 \pm i\}$

$$\begin{array}{r|rrrr} 3 & 1 & -9 & 28 & -30 \\ & & 3 & -18 & 30 \\ \hline & 1 & -6 & 10 & 0 \end{array}$$

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

$$x^2 - 6x + 9 = -10 + 9$$

$$(x-3)^2 = -1$$

$$(x-3)^2 = \pm\sqrt{-1}$$

$3 \pm i$

10. Solve to find all the zeros: $f(x) = x^3 - 3x^2 + x - 3$

$\{3, \pm i\}$

$$\begin{array}{r|rrrr} 3 & 1 & -3 & 1 & -3 \\ & & 3 & 0 & 3 \\ \hline & 1 & 0 & 1 & 0 \end{array}$$

$$x^2 + 1 = 0$$

$$x^2 = -1$$

$$x = \pm i$$

11. Is $x + 4$ is a factor of the polynomial $3x^3 + 12x^2 - 3x - 12$? If so, find the remaining factors.

$$\begin{array}{r|rrrr} -4 & 3 & 12 & -3 & -12 \\ & & -12 & 0 & 12 \\ \hline & 3 & 0 & -3 & 0 \end{array}$$

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

12 Write a polynomial in **factored form** with roots at $X = -5$ with multiplicity 2, $x = -3$ with multiplicity 3, and $x = 0$ with multiplicity 1.

$$y = x(x+5)^2(x+3)^3$$

15. Application Problem

A metal worker wants to make an open box from a 12 in x 8 in sheet of metal by cutting equal squares from each corner. **ROUND TO THE NEAREST HUNDRETH!!**

a. Write a function for the Volume of the box. (1 pt)

$$V = (12 - 2x)(8 - 2x)x$$

b. Find the maximum volume of the box and the side length of the cut out squares that generates that volume. (2 pts)

Max Volume: 67.6
 Length: 1.57

Review. (3 pts each)

16. Solve using completing the square.

$$x^2 - 8x + 4 = 0$$

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

$$(x-4)^2 = 12$$

$$x = 4 \pm 2\sqrt{3}$$

17. Find the discriminant and completely describe the roots. $3x^2 + 2x = -1$

$$2^2 - 4(3)(-1)$$

$$4 - 12$$

$$-8 \text{ 2 imag.}$$

H. Math 3 Remediation Sheet for Unit 3

Name _____

<p>1) Write in exponential form $\ln x = p$</p> <p>$e^p = x$</p>	<p>2) Write in log form $m^c = p$</p> <p>$\log_m p = c$</p>
<p>3) Expand: $\log x^4 y^3$</p> <p>$4 \log x + 3 \log y$</p>	<p>4) Condense: $5 \log_2 x - 4 \log_2 m$</p> <p>$\log_2 \frac{x^5}{m^4}$</p>
<p>5) Simplify: $(5e^{-4x})^{-2}$</p> <p>$5^{-2} e^{8x}$</p> <p>$\frac{e^{8x}}{25}$</p>	<p>6) Solve: $e^{2x} - 5 = 19$</p> <p>$\ln e^{2x} = \ln 24$</p> <p>$2x \ln e = \ln 24$</p> <p>$x = 1.59$</p>
<p>7) Solve: $14 - \ln(x-3) = 8$</p> <p>$-\ln(x-3) = -6$</p> <p>$\ln(x-3) = 6$</p> <p>$e^6 = x-3$</p> <p>406.43</p>	<p>8) Solve: $25^{x+4} = 125^{3x-2}$</p> <p>$(5^2)^{x+4} = (5^3)^{3x-2}$</p> <p>$5^{2x+8} = 5^{9x-6}$</p> <p>$2x+8 = 9x-6$</p> <p>$14 = 7x$</p> <p>$2 = x$</p>
<p>9) Solve: $\log_5(x+3) + \log_5(x+2) = \log_5 6$</p> <p>$\log_5(x^2 + 5x + 6) = \log_5 6$</p> <p>$x^2 + 5x + 6 = 6$</p> <p>$x^2 + 5x = 0$</p> <p>$x(x+5) = 0$</p> <p>$x = 0$ $x = -5$</p>	<p>10) Suppose you deposit \$4500 in an account that pays 3.5% interest compounded quarterly. How long will it take to reach \$7000?</p> <p>$7000 = 4500 \left(1 + \frac{0.35}{4}\right)^{4(t)}$</p> <p>$\log 1.555556 = \log (1.0875)^{4t}$</p> <p>$12.6845$</p>

H. Math 3 Remediation Sheet for Unit 3

Name _____

11) Suppose you invest \$700 in the bank and it is compounded continuously. How long will it take to double?

$A = Pe^{rt}$ 4.25
 $1400 = 700e^{.0425t}$
 $2 = \ln e^{.0425t}$
 $\ln 2 = .0425t \ln e$
16.31 yrs

12) A cup of coffee contains 140 mg of caffeine. If caffeine is eliminated from the body at a rate of 12% per hour, how long will it take for half of this caffeine to be eliminated?

$y = 140(1 - .12)^x$
 $70 = 140(1 - .12)^x$
 $.5 = (.88)^x$
5.42

13) Suppose you invest \$850 in a bank at 3.25% interest compounded monthly. How much money will you have in 8 years?

$A = 850(1 + \frac{.0325}{12})^{12(8)}$
\$ 1102.60

14) Evaluate: $\log_2 8 - \log_2 4$

$\log_2 \frac{8}{4}$
 $\log_2 2$
1

15) Harry purchased a car for \$26,700. The value of the car decreases by 13% every year. What will be the value of the car in 10 years?

$y = 26,700(1 - .13)^{10}$
\$ 6632.91

16) Write a function that translates $y = 3^x$ five units to the left and 4 units up

$y = 3^{x+5} + 4$

17) Solve: $x^2 - 6x - 3 = 0$

$x^2 - 6x + 9 = 3 + 9$
 $(x-3)^2 = 12$
 $x-3 = \pm 2\sqrt{3}$
 $3 \pm 2\sqrt{3}$

18) Solve: $2|x - 4| - 3 > 9$

$|x-4| > 6$
 $x-4 > 6$ OR $-x+4 > 6$
 $x > 10$ OR $-x > 2$
 $x < -2$

19) Find $f \circ g(x)$ if $f(x) = x^2 - 7$ & $g(x) = 3x - 2$

$f(g(x))$
 $f(3x-2)$
 $(3x-2)^2 - 7$
 $9x^2 - 12x + 4 - 7$

$9x^2 - 12x - 3$

20) Find $f^{-1}(x)$ if $f(x) = 7x - 2$

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

$f^{-1}(x) = \frac{x+2}{7}$

Unit 3 review pg 3

① $y = 0.5 (1.67)^x$

$b > 1$ growth

$1+r = 1.67$

$r = 0.67 = \text{67%}$ growth rate

initial amount: 0.5 = a

② $y = 1.14^x$

a = 1

b = 1.14

growth

$1+r = 1.14 \rightarrow r = \text{0.14}$

initial amount: 1

③ a = 2

decay

$1 - \frac{9}{10} = \text{0.1}$

④ a = 4.1

decay

$1 - 0.72 = \text{0.28} = r$

⑤ $A = P \left(1 + \frac{r}{n}\right)^{nt}$

$A = 1000 \left(1 + \frac{0.045}{1}\right)^{(1 \cdot 30)}$

A = 3745.32

⑥ $y = a(b)^t$

$y = 48000 (1 - 0.15)^5$

y = 21,297.86

⑦ $A = Pe^{rt}$

$A = 900 e^{(0.06)(5)}$

A = 1,214.87

⑧ $y = 3^x - 1$

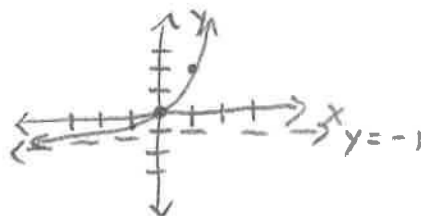
Asymptote: $y = -1$

Domain: \mathbb{R}

Range: $(-1, \infty)$

EB: As $x \rightarrow \infty$,
 $y \rightarrow \infty$.

As $x \rightarrow -\infty$,
 $y \rightarrow -1$.

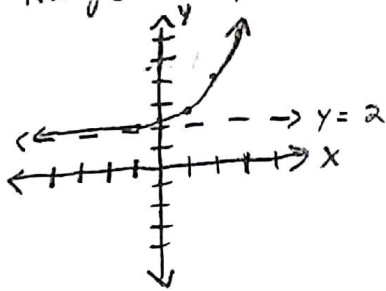


$$(9) \quad y = 2^{(x-2)} + 2$$

Asymptote: $y = 2$

Domain: \mathbb{R}

Range: $(2, \infty)$



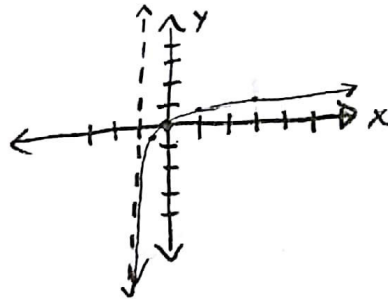
EB: As $x \rightarrow \infty$, $y \rightarrow \infty$.
As $x \rightarrow -\infty$, $y \rightarrow 2$.

$$(10) \quad \log_4(x+1)$$

Asymptote: $x = -1$

Domain: $(-1, \infty)$

Range: $(-\infty, \infty)$



EB: As $x \rightarrow \infty$, $y \rightarrow \infty$
As $x \rightarrow -1$, $y \rightarrow -\infty$

$$(11) \quad 100 = 10^2$$
$$\log_{10} 100 = \log_{10} 10^2$$
$$\log_{10} 100 = 2 \cdot \log_{10} 10$$
$$\boxed{\log_{10} 100 = 2}$$

$$(12) \quad 9^3 = 729$$
$$\log_9 9^3 = \log_9 729$$
$$\boxed{3 = \log_9 729}$$

$$(13) \quad 64 = 4^3$$
$$\boxed{\log_4 64 = 3}$$

$$(14) \quad \log 1000 = \log_{10} 10^3 = \boxed{3}$$

$$(15) \quad \log_4 256 = \log_4 4^4 = \boxed{4}$$

$$(16) \quad \log_{27} 9 = x \quad \text{OR} \quad \text{calculator!!}$$
$$9 = 27^x$$
$$(3^2)^{4/3} = (3^3)^x$$
$$\boxed{x = \frac{4}{3}}$$
$$\frac{\log 9}{\log 27} = 1.\bar{3} = \frac{4}{3}$$

Unit 3 review (cont) (pg 4)

$$\textcircled{17} \log_3(x+1) = 4$$

$$3^{\log_3(x+1)} = 3^4$$

$$x+1 = 3^4$$

$$x = 3^4 - 1 = \boxed{80}$$

$$\textcircled{18} e^{x/4} = 5$$

$$\frac{x}{4} \ln e = \ln 5$$

$$\frac{x}{4} = \ln 5$$

$$x = \boxed{4 \ln 5 = 6.44}$$

$$\textcircled{19} \log x + \log 2 = 5$$

$$\log 2x = 5$$

$$2x = 10^5$$

$$x = \frac{10^5}{2} = \boxed{50,000}$$

$$\textcircled{20} \ln x - \ln 4 = 7$$

$$\ln \frac{x}{4} = 7$$

$$\frac{x}{4} = e^7$$

$$x = \boxed{4e^7}$$

$$\textcircled{21} 6^{3x+2} = 18$$

$$\log_6 6^{3x+2} = \log_6 18$$

$$3x+2 = \log_6 18$$

$$3x+2 = 1.61$$

$$x = \boxed{-0.129}$$

$$\textcircled{22} e^{3x+2x} = 20$$

$$e^{5x} = 20$$

$$5x = \ln 20$$

$$x = \boxed{\frac{\ln 20}{5} = 0.599}$$

$$\textcircled{24} 5e^{2x} - 1 = 9$$

$$e^{2x} = 2$$

$$2x = \ln 2$$

$$x = \boxed{\frac{\ln 2}{2} = 0.347}$$

$$\textcircled{25} \log(3x) = \log 12$$

$$3x = 12$$

$$\boxed{x = 4}$$

$$\textcircled{26} \quad a = 200$$

half-life means $b = \frac{1}{2}$

$$Y = 200 \left(\frac{1}{2}\right)^{t/1600} \leftarrow \div \text{ by half-life}$$

$$Y = 200 \left(\frac{1}{2}\right)^{500/1600}$$

$$Y = \boxed{161.05 \text{ g}}$$

$$\textcircled{27} \quad \ln e^6 = \boxed{6}$$

$$\textcircled{28} \quad e^{\ln 3} = \boxed{3}$$

$$\textcircled{29} \quad \log_2 2 = \boxed{1}$$

$$\textcircled{30} \quad \boxed{8}$$

Part I - Multiple Choice. Circle the correct answer. (2 pts each)

1. Which expression is the least common multiple of $x^2 - 1$ and $x^2 - x$?
 a. $x^2(x-1)^2(x+1)^2$ b. $x(x-1)^2(x+1)$ c. $x-1$ d. $x(x-1)(x+1)$

2. Simplify $\frac{x^2+5x+4}{x^2+2x+1} \cdot \frac{2x+2}{x+4}$.
 a. $\frac{1}{2}$ b. $\frac{(x+4)^2}{2(x+1)^2}$ c. 2 d. $\frac{x+4}{2(x+1)}$

Part II - Simplify. Circle answer

3. $\frac{x^2-4x}{x^2+7x-18} \cdot \frac{x^2-81}{x^2-11x+18}$
 $\frac{x(x-4)}{x+9 \quad x-2} \cdot \frac{x-9 \quad x+9}{x-9 \quad x-2}$
 $\frac{x(x-4)}{(x-2)^2}$

4. $\frac{x+1}{5xy} \div \frac{x+1}{4x^2y}$
 $\frac{x+1}{5xy} \cdot \frac{4x^2y}{x+1} = \frac{4x}{5}$

5. $\frac{x^2+4x+3}{x^2+6x+9} \cdot \frac{2x+6}{2x+2}$
 $\frac{x+3 \quad x+1}{x+3 \quad x+3} \cdot \frac{2(x+3)}{2(x+1)}$
 (1)

6. $\frac{3z^2-15z+18}{z^2-4} \div \frac{z^2-2z-3}{z^2+4z+4}$
 $\frac{3(z-2)(z-3)}{(z-2)(z+2)} \cdot \frac{(z+2)(z+2)}{(z+1)(z+2)}$
 $\frac{3(z-3)}{(z+1)}$

Simplify. Addition/Subtraction.

7. $\frac{5}{x-2} + \frac{-2}{x+3}$
 $\frac{5x+15 - 2x+4}{x-2 \quad x+3}$
 $\frac{3x+19}{x-2 \quad x+3}$

8. $\frac{3}{x^2+3x-10} + \frac{1}{x-2}$
 $\frac{3}{(x+5)(x-2)} + \frac{x+5}{(x+5)(x-2)}$
 $\frac{x+8}{(x+5)(x-2)}$

$$9. \frac{x^2}{x^2-x-30} + \frac{4(x+5)}{x-6}$$

$$\frac{x^2 + 4x + 20}{(x-6)(x+5)}$$

$$10. \frac{x}{x^2+4x+4} + \frac{5}{x^2-4}$$

$$\frac{x}{(x+2)^2} + \frac{5}{(x-2)(x+2)}$$

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

Solve each equation and check your solution.

$$11. \frac{9x}{9} + \frac{1}{x} = \frac{9x}{9}$$

$$x + 9 = 4x$$

$$x = 3$$

$$12. \frac{1}{x-4} = \frac{2}{x-2}$$

$$x-2 = 2x-8$$

$$6 = x$$

$$13. \frac{2x}{x-2} - \frac{1}{3} = \frac{1}{3x-6}$$

$$6x - x + 2 = 1$$

$$5x = -1$$

$$x = -\frac{1}{5}$$

$$14. \frac{6}{y+2} + \frac{1}{y-2} = 1$$

$$6y-12 + y+2 = y^2-4$$

$$7y-10 = y^2-4$$

$$y^2-7y+6$$

$$y-6 \quad y-1$$

$$y=6 \quad y=1$$

Simplify

$$16. \frac{\frac{5}{x+3} + \frac{8}{x-2}}{\frac{6}{x+3}}$$

$$\frac{5x-10+8x+24}{x+3 \quad x-2}$$

$$\frac{13x+14}{(x+3)(x-2)} \cdot \frac{x+3}{6}$$

$$\frac{13x+14}{6(x-2)}$$

I. Graphing. Complete the table for #1-3. No decimals!

Function	Root(s)	y-intercept	Horizontal Asymptote	Vertical Asymptote
1. $f(x) = \frac{4}{x-2} + 7$	$(\frac{16}{7}, 0)$	$(6, 5)$	$y = 7$	$x = 2$
2. $f(x) = \frac{3x+1}{x-4}$	$(-\frac{1}{3}, 0)$	$(0, \frac{1}{4})$	$y = 3$	$x = 4$
3. $f(x) = \frac{(x-6)(x+3)}{3x-2}$	$(6, 0)$ $(-3, 0)$	$(0, 9)$	None	$x = \frac{2}{3}$

II. Multiply/Divide – Show all your work and box your final answer!

<p>4. $\frac{x^2+2x+1}{x^2+5x+4} \cdot \frac{x+4}{2x+2}$</p> <p>$\frac{(x+1)(x+1)}{(x+4)(x+1)} \cdot \frac{x+4}{2(x+1)}$</p> <p>$\frac{1}{2}$</p>	<p>5. $\frac{3x^2+15x}{x^2-36} \cdot (x^2-x-30)$</p> <p>$\frac{3x(x+5)}{(x-6)(x+6)} \cdot \frac{(x-6)(x+5)}{1}$</p> <p>$\frac{3x(x+5)^2}{x+6}$</p>	<p>6. $\frac{x^2+8x-20}{5x^3+50x^2} \div \frac{x^2+7x-18}{x^2+9x}$</p> <p>$\frac{(x+10)(x-2)}{5x^2(x+10)} \cdot \frac{x(x+9)}{(x+9)(x-2)}$</p> <p>$\frac{1}{5x}$</p>
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III. Add/Subtract – Show all your work and box your final answer!

<p>7. $\frac{8}{x^2+9x+18} + \frac{x+5}{x^2+x-6}$</p> <p>$\frac{8}{(x+6)(x+3)} + \frac{x+5}{(x+3)(x-2)}$</p> <p>$\frac{8x-16}{(x+6)(x+3)(x-2)} + \frac{x^2+11x+30}{(x+6)(x+3)(x-2)}$</p> <p>$\frac{x^2+19x+14}{(x+6)(x+3)(x-2)}$</p>	<p>8. $\frac{x}{2x-2} - \frac{-2x+1}{x^2-4x+3}$</p> <p>$\frac{x}{2(x-1)} + \frac{2x-1}{(x-3)(x-1)}$</p> <p>$\frac{x^2-3x}{2(x-1)(x-3)} + \frac{4x-2}{2(x-1)(x-3)}$</p> <p>$\frac{x^2+x-2}{2(x-1)(x-3)}$</p> <p>$\frac{(x+2)(x-1)}{2(x-1)(x-3)}$</p> <p>$\frac{x+2}{2(x-3)}$</p>	<p>9. $\frac{3x}{x^2+4x+4} + \frac{6}{x^2-4}$</p> <p>$\frac{3x}{(x+2)(x+2)} + \frac{6}{(x-2)(x+2)}$</p> <p>$\frac{3x^2+6x}{(x+2)^2(x-2)} + \frac{6x+12}{(x+2)^2(x-2)}$</p> <p>$\frac{3x^2+12x+12}{(x+2)^2(x-2)}$</p> <p>$\frac{3(x+2)(x+2)}{(x+2)^2(x-2)}$</p> <p>$\frac{3}{x-2}$</p>
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IV. Simplify – Show all your work and box your final answer!

<p>$\frac{x+2}{2(x-3)}$</p>	<p>$\frac{3(x+2)(x+2)}{(x+2)^2(x-2)}$</p> <p>$\frac{3}{x-2}$</p>
--	--

$$10. \frac{\frac{4}{x} - \frac{1}{2}}{\frac{3}{4} + \frac{5}{x+2}}$$

$$\frac{\frac{8}{2x} + \frac{-1x}{2x}}{\frac{3x+6}{4(x+2)} + \frac{20}{4(x+2)}}$$

$$\frac{8-x}{2x} \div \frac{3x+26}{4(x+2)}$$

$$\frac{8-x}{2x} \cdot \frac{4(x+2)}{3x+26}$$

$$\frac{4(x+2)(8-x)}{2x(3x+26)}$$

$$\frac{2(x+2)(8-x)}{x(3x+26)}$$

IV. Solve each equation. Be sure to check for extraneous solutions. (3 pts each)

11.

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

$$\frac{x+2}{(x-2)(x+2)} + \frac{2x^2-8}{(x-2)(x+2)} = \frac{3x^2-6x}{(x-2)(x+2)}$$

$$\{6, 1\}$$

$$2x^2 + x - 6 = 3x^2 - 6x$$

$$0 = x^2 - 7x + 6$$

$$= 0 = (x-6)(x-1)$$

12.

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

$$5x^2 - 5 = 30x - 30$$

$$5x^2 - 30x + 25 = 0$$

$$x^2 - 6x + 5 = 0$$

$$x-5 \quad x-1$$

$$\{5, 1\}$$

13.

$$\frac{3x}{x+1} + \frac{6}{2x} = \frac{7}{x}$$

$$\frac{6x}{2x(x+1)} + \frac{6x+6}{2x(x+1)} = \frac{14x+14}{2x(x+1)}$$

$$\{2, \frac{-2}{3}\}$$

$$6x^2 + 6x + 6 = 14x + 14$$

$$6x^2 - 8x - 8 = 0$$

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

$$3x^2 - 6x + 2x - 4 = 0$$

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

$$\frac{-12}{-6} = 2$$

$$\frac{-4}{-4} = 1$$

14.

$$\frac{x^2-4}{x} = -3$$

$$x^2 - 4 = -3x$$

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

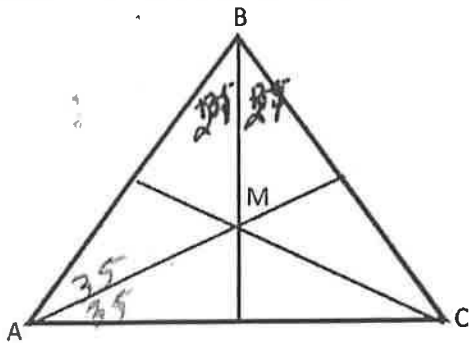
$$(x+4)(x-1) = 0$$

$$x = -4$$

$$x = 1$$

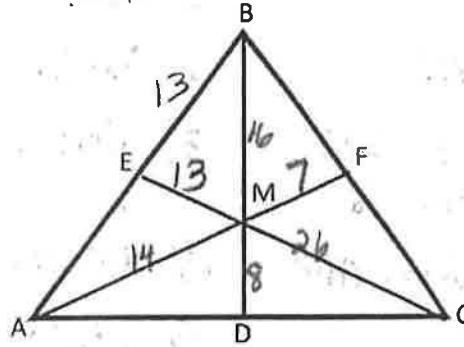
$$\{-4, 1\}$$

1. M is the incenter of $\triangle ABC$, $m\angle CBM = 27^\circ$, and $m\angle CAM = 35^\circ$. Solve for $m\angle ACB$.



$m\angle ACB = \underline{56}$

2. M is the centroid of $\triangle ABC$, with $EB = 13$, $MF = 7$, and $BM = 16$. Solve for the following:

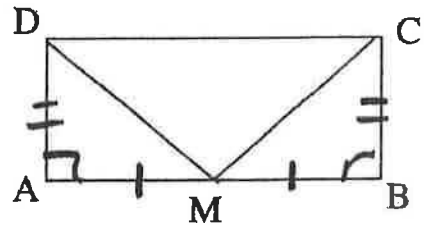


$\frac{23}{12} \frac{5}{3}$

$AB = \underline{26}$
 $BD = \underline{24}$

$AM = \underline{14}$
 $MD = \underline{8}$

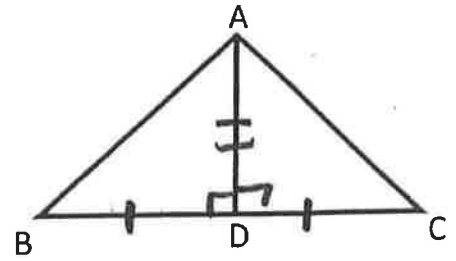
3. Given: $\square ABCD$ is a rectangle, and M is the midpoint of \overline{AB} . Prove: $\overline{DM} \cong \overline{CM}$



Statements	Justifications
1.	1. Given
2. $\angle A \cong \angle B$ or $\angle C \cong \angle D$	② Defn \square
3. $\overline{AD} \cong \overline{CB}$	③ All rt angles \cong
④ $AM = MB$	④ Defn midpt
⑤ $\overline{AM} \cong \overline{MB}$	⑤ Defn \cong seg
⑥ $\overline{DA} \cong \overline{CB}$	⑥ Defn \square
⑦	⑦ SAS
⑧	⑧ CPCTC.

5

4. Given: $\overline{BD} \cong \overline{CD}$, and $\overline{BC} \perp \overline{DA}$.
 Prove: $\triangle ABD \cong \triangle ACD$.



1.
 2) $\overline{AD} \cong \overline{AD}$
 3) $\angle ADB + \angle ADC$
 are rt \angle
 4) $\angle ADB \cong \angle ADC$
 5

1) Given
 2) Refl.
 3) Defn. \perp
 4) All rt \angle are \cong
 5 SAS.

5

In question 5 and 6 expressions are given that represent angle measures. Given $\overline{l} \parallel \overline{m}$, solve for x and the angle named.

5.

$5x + 14$
 2
 156
 $-6(2 - 3x)$
 24

$5x + 14 = -12 + 18x$
 $26 = 13x$
 $x = 2$ $m \angle 2 = 156$

6.

$5x - 2$
 27
 $2x - 35$
 1

$7x - 37 = 180$

$x = 31$ $m \angle 1 = 153$

4

7. What is the length of BD in rhombus $ABCD$? $DM = x$

$x + 3$
 $3x - 15$
 9
 M
 x
 9

$x + 3 = 3x - 15$
 $18 = 2x$
 $9 = x$

$BD = 18$

8. Given isosceles trapezoid $CRAB$, what is RA ?

$3x + 11$
 19
 $6x - 18$

$19 = \frac{1}{2}(3x + 11 + 6x - 18)$
 $38 = 9x - 7$
 $45 = 9x$
 $5 = x$

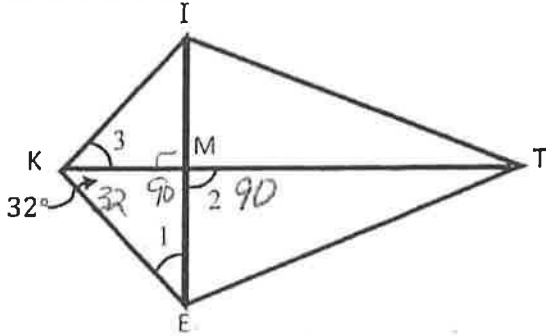
$RA = 20$

4

$3(5) + 11$
 $15 + 11$
 26

13

9. Given \square KITE is a kite, solve for the measure of the marked angles.

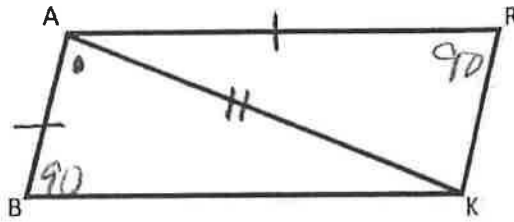


$m \angle 1 = 58$

$m \angle 2 = 90$

$m \angle 3 = 32$

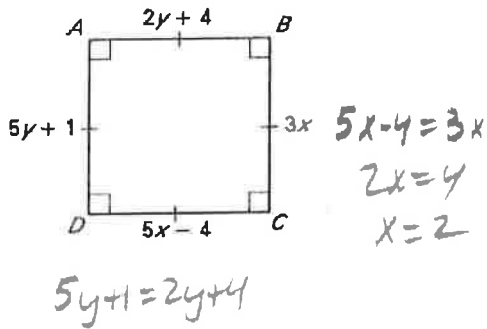
10. \square BARK is a parallelogram, with $m \angle R = 90^\circ$, and $\overline{BA} \cong \overline{AR}$. Solve for $m \angle BAK$.



$m \angle BAK = 45^\circ$

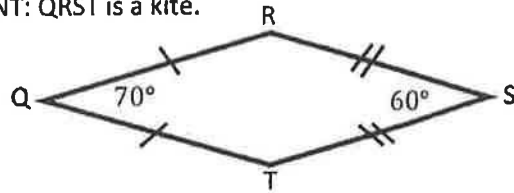
4

11. Find the values of x and y such that \square ABCD is a square.



$x = 2$ $y = 1$

12. Solve for the measure of angles R and T .
HINT: QRST is a kite.

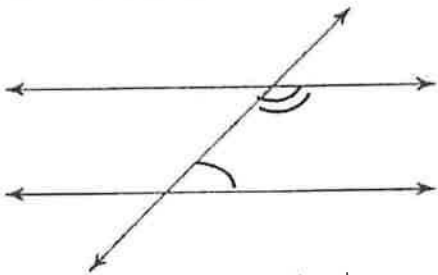


$m \angle R = 115^\circ$

$m \angle T = 115^\circ$

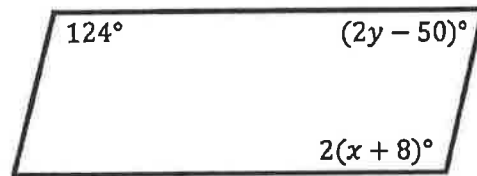
4

13. Fill in the blanks below.



The two angles marked are con. int angles
and are Complementary or Supplementary?
What type of angles?

14. Given the parallelogram, solve for x and y .



$x = 54$

$y = 53$

$2x + 16 = 124$

$2y - 50 = 56$

$2y = 106$

4

Round all answers to the nearest tenth. *2pts each

1. Write the equation of a circle with center (5,-3) and a diameter of 8.

$$x^2 - 10x + 25 + y^2 + 6y + 9 = 16$$

$$(x-5)^2 + (y+3)^2 = 16$$

2. If a central angle of a circle with radius of 6 cm measures 70°, find the length of its intercepted arc.

$$\frac{AL}{2\pi(6)} = \frac{70}{360}$$

7.3

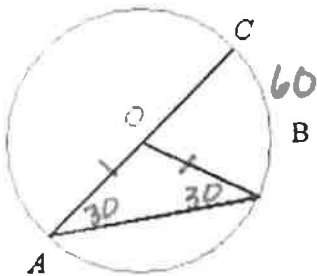
3. What is area of a sector formed by a 36° angle in a circle with radius of 7-in?

$$\frac{AS}{\pi(7)^2} = \frac{36}{360}$$

15.4

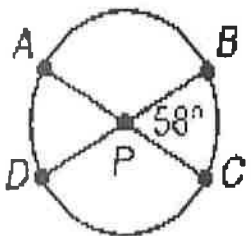
4. Given: In $\odot O$, $m\widehat{BAC} = 300^\circ$. Find $m\angle B$.

30°



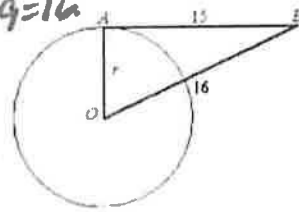
Find the measure of \widehat{DBC} in $\odot P$.

238°



180
58

6. You are standing at point B. Point B is 16 feet from the center of the circular water storage tank and 15 feet from point A. \overline{AB} is tangent to $\odot O$ at A. Find the radius of the tank.

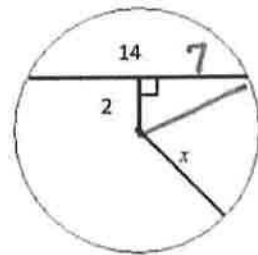


$$\sqrt{31} = 5.6$$

$$r^2 + 15^2 = 16^2$$

7. Find x.

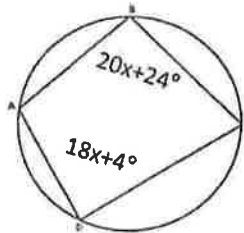
$\sqrt{53}$ 7.3



$$2^2 + 7^2 = x^2$$

8. Find $\angle D$.

76°



$$20x + 24 + 18x + 4 = 180$$

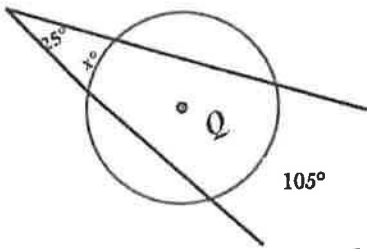
$$38x + 28 = 180$$

$$38x = 152$$

$$x = 4$$

$$18(4) + 4$$

9. Find the measure of the arc indicated. $25 = \frac{1}{2}(105 - x)$

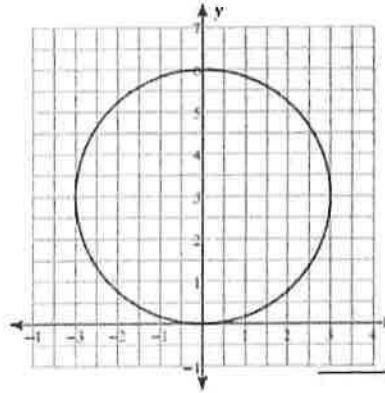


$$50 = 105 - x$$

$$55 = x$$

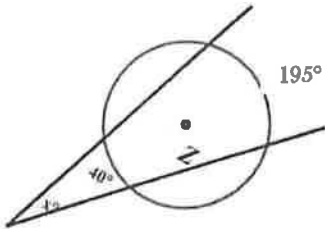
55°

18. Write the equation for the picture below.



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

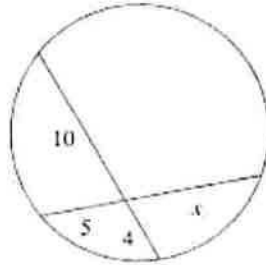
10. Find the measure of the angle indicated.



$$x = \frac{1}{2}(195 - 40)$$

77.5

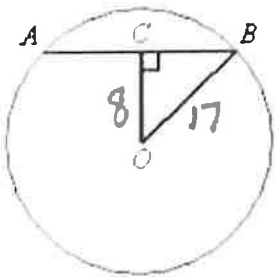
19. Find x



$$5x = 40$$

$x = 8$

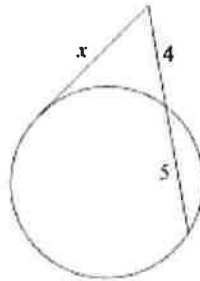
11. Given circle O with radius 17 and $OC = 8$. Find the length of \overline{AB} .



$$8^2 + x^2 = 17^2$$

~~16~~ 30

20. Find x

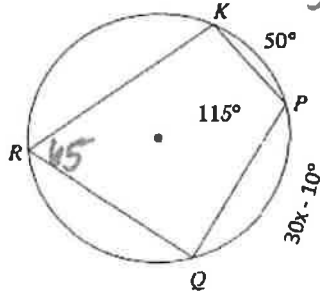


$$x^2 = 4(9)$$

$$x = \pm 6$$

$x = 6$

12. Find the value of x.



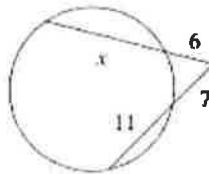
$$50 + 30x - 10 = 130$$

$$30x + 40 = 130$$

$$30x = 90$$

$x = 3$

21. Find x



$$6(x+6) = 7(18)$$

$$6x + 36 = 126$$

$x = 15$

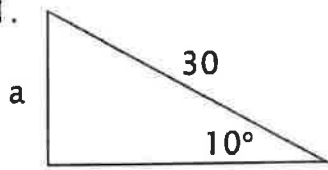
17. Write the following equation of a circle in standard form $x^2 + y^2 + 4x - 6y + 4 = 0$.

$$x^2 + 4x + 4 + y^2 - 6y + 9 = -4 + 4 + 9$$

$$(x+2)^2 + (y-3)^2 = 9$$

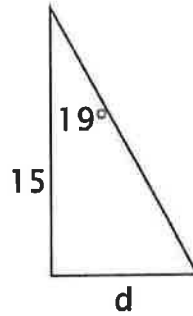
All triangles are right triangles. Solve for the variables. (2 pts. each)

1.



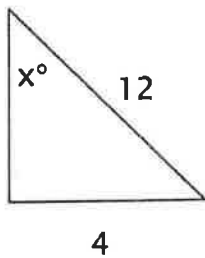
a = 5.2

2.



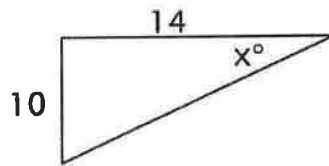
d = 5.2

3.



x = 19.5°

4.



x = 35.5°

II. II. Convert each. (2 pts ea.) (Show your work!!)

5. 160° to radians

$\frac{8\pi}{9}$

6. $\frac{7\pi}{5}$ to degrees

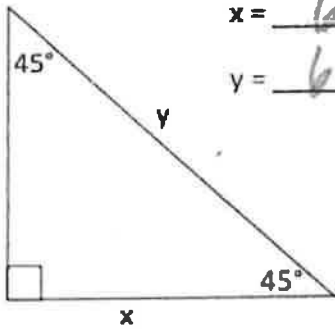
252°

Calculator Inactive

NAME _____

Form A | Use the properties of special right triangles (30° - 60° - 90° and 45° - 45° - 90°) to solve problems. (2 pts. each)

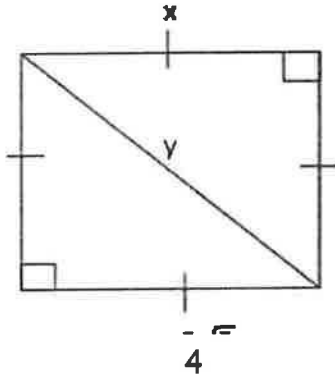
1.



$x = 6$

$y = 6\sqrt{2}$

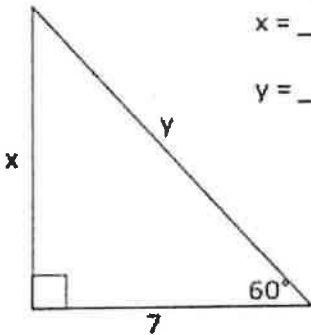
2.



$x = 4$

$y = 4\sqrt{2}$

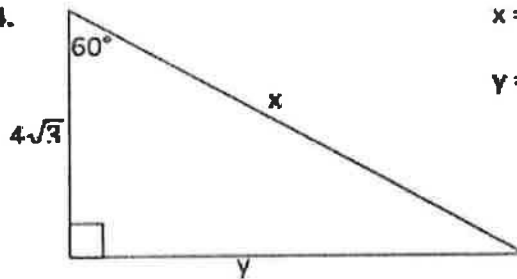
3.



$x = 7\sqrt{3}$

$y = 14$

4.



$x = 8\sqrt{3}$

$y = 12$

Multiple Choice (6 each)

D 5. Which angle is coterminal to 120° ?

- a. 120 radians
- b. 240°
- c. -120°
- d. -240°

7. What is the exact value of $\sin 30^\circ$?

- a. $\frac{\sqrt{3}}{2}$
- b. $\frac{1}{2}$
- c. $-\frac{\sqrt{3}}{2}$
- d. $\frac{\sqrt{2}}{2}$

(B)

A 6. Which angle is coterminal to $\frac{2\pi}{7}$?

- a. $\frac{10\pi}{7}$
- b. $-\frac{2\pi}{7}$
- c. $-\frac{2\pi}{7}$
- d. $\frac{2\pi}{7}$

8. Which angle has a cosine of $-\frac{\sqrt{3}}{2}$?

- a. 60°
- b. 300°
- c. 150°
- d. 120°

(C)

Find the following. (1 pt. each)

9. $\sin 150^\circ$

$\frac{1}{2}$

10. $\cos \frac{2\pi}{3}$

$-\frac{1}{2}$

11. $\tan 300^\circ$

$-\sqrt{3}$

12. $\tan \pi$

0

13. $\sin 240^\circ$

$-\frac{\sqrt{3}}{2}$

14. $\tan \frac{7\pi}{6}$

$\frac{\sqrt{3}}{3}$

15. $\cos 180^\circ$

-1

16. $\tan 45^\circ$

1

17. $\sin \frac{3\pi}{2}$

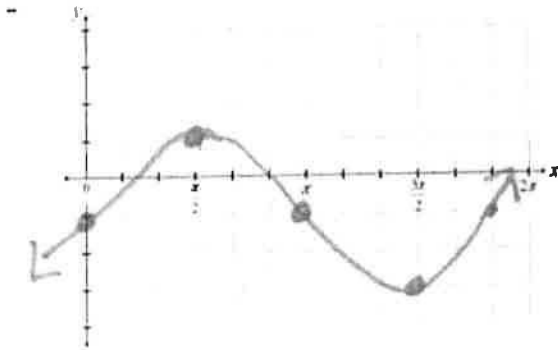
-1

18. The point P has coordinates (3,-1) and is on the terminal side of angle θ . Evaluate the six trigonometric functions for θ . If the function is undefined, write "undefined." (1pt each)

$\sin \theta$	$-\frac{\sqrt{10}}{10}$	$\cos \theta$	$\frac{3\sqrt{10}}{10}$	$\tan \theta$	$-\frac{1}{3}$
$\csc \theta$	$\sqrt{10}$	$\sec \theta$	$\frac{\sqrt{10}}{3}$	$\cot \theta$	-3

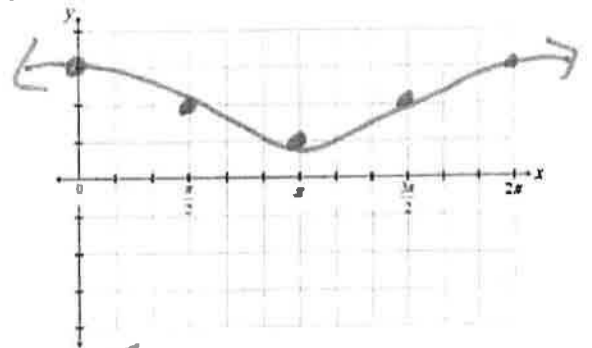
GRAPH THE FOLLOWING. Show at least 5 exact points.

19. $Y = 2\sin(x) - 1$



Period 2π Amplitude 2

20. $y = \cos(x) + 2$



Period $\frac{\pi}{2}$ Amplitude 1