Honors Math 3 Unit 1 Review Name Key

SHOW ALL WORK! (3 pts each)

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

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

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

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

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
$3x^2$	$12x^3$	$-6x^2$
-1	$-4x$	$+2$

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

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

$g(f(x)) =$

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

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

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

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

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

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.

$P = 2L + 2w$

$\begin{cases} 94 = 2L + 2w \\ L = 3w - 1 \end{cases}$

$94 = 2(3w-1) + 2w$

$94 = 6w - 2 + 2w$

$94 = 8w - 2$

$96 = 8w$

$12 = w$ cm

$L = 3(12) + 1$

$L = 35$ cm

35 cm x 12 cm

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?

$q + d = 45$ # of coins

$.25q + .10d = 8.70$ value of coins

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

$.25q + .10d = 8.70$

$\frac{.15q}{.15} = \frac{4.20}{.15}$

$q = 28$ 28 quarters

$28 + d = 45$ $d = 17$ + 17 dimes

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 than75, 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.

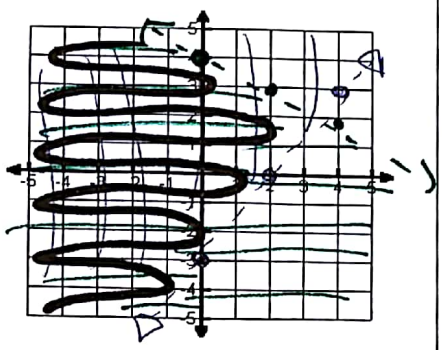
$y = \begin{cases} 10x & 0 < x \leq 75 \\ 8x & x > 75 \end{cases}$

9. Graph the system of inequalities.

$3x - 2y < 6$
$x + 2y < 8$

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

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

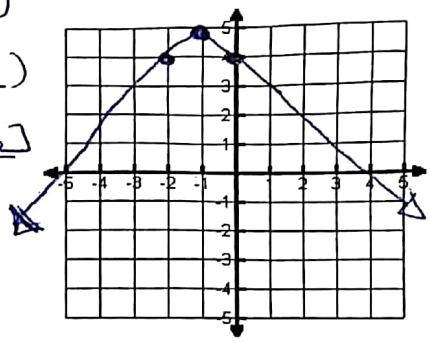


10. Graph $y = -|x + 1| + 5$

Vertex $(-1, 5)$

Domain $(-\infty, \infty)$

Range $(-\infty, 5]$



11. Solve and graph the solution on a number line

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

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

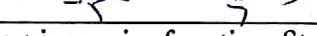
$|x-1| < 6$

$x - 1 > -6$ and
$+1 \quad +1$
$x > -5$

$x - 1 < 6$
$+1 \quad +1$
$x < 7$

$x > -5$ and $x < 7$ OR

$-5 < x < 7$ (open)



12. Solve and graph the solution on a number line

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

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

$|x+3| > 6$

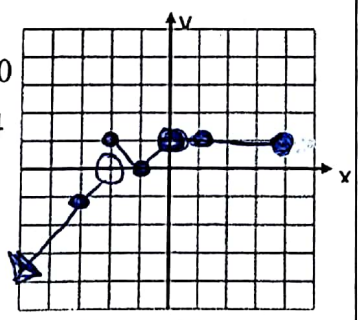
$x + 3 > 6$ OR $x + 3 < -6$
$-3 \quad -3$ $\quad -3 \quad -3$

$x > 3$ OR $x < -9$

open

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

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



Domain: $(-\infty, 4]$

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

x	y
-3	$-3+2=-1$
-2	$-2+2=0$ open
-2	$\lvert-2+1\rvert=1$ closed
-1	$\lvert-1+1\rvert=0$
0	$\lvert0+1\rvert=1$ open
0	1 closed
1	1
4	1

14. Solve by SUBSITUTION!

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

$x = 9y + 25$

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

$54y + 150 - 5y = 3$

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

$y = -3$

$x = 9(-3) + 25$

$x = -27 + 25$

$x = -2$

$(-2, -3)$

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

4) Given the system $\begin{matrix} 4x - 3y = 8 \\ 8x - 6y = 16 \end{matrix}$ Which statement is true?

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

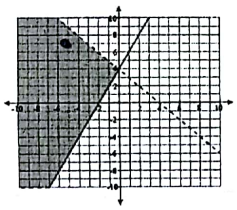
5) Pick which ordered pair is a solution of the system of linear equations. $\begin{matrix} 3x - 2y = 11 \\ -x + 6y = 7 \end{matrix}$

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 graph below, what is a solution to the system?



A. (-2, 6)

B. (-5, 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? $\begin{matrix} 3x + 5y = 7 \\ -2x + y = 8 \end{matrix}$

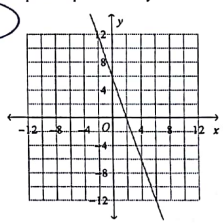
A. 3 B. −5 C. −1 D. 2

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

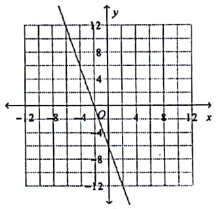
A. (4, -1) B. (-1, 2) C. (2,1) D. (-2, 1)

10) Graph the equation -3x – y = 6

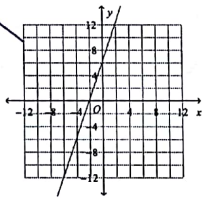
A.



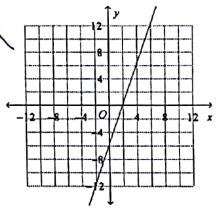
B.



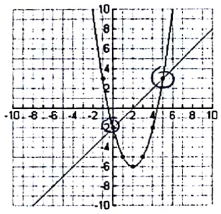
C.



D.



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. (5,3) and (0,-2)

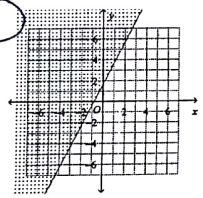
12) The equations $5x + 2y = 48$ and $3x + 2y = 32$ represent the money collected from school concert ticket sales during two class periods. If x represents the cost for each adult ticket and y represents the cost for each student ticket, what is the cost for each adult ticket?

A. 4 B. 8 C. 20 D. 10

$5x+2y=48$
$-3x-2y=-32$
$2x=16$
$x=8$

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

A.



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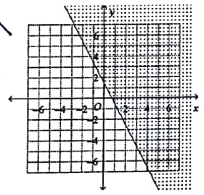
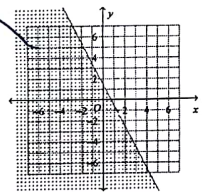
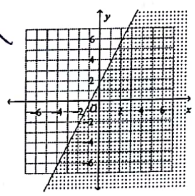


C.



D.



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

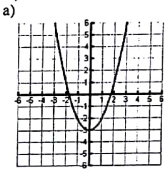
A. -9 B. -8 C. 1 D. 7

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. (0, 1) D. (0, -2)

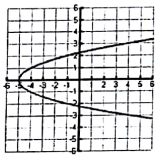
16) Determine which of the following relations are functions. Circle your answer.

a)



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

b)



Is it a function? (circle one): 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 $y = -0.48t + 67.2$ and $y = 0.48t + 32.9$ 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.

$-.48t+67.2=.48t+32.9$
$+.48t \quad -32.9 \quad +.48t \quad -32.9$
$34.3=.96t$
$36 \approx t$
$+1840$

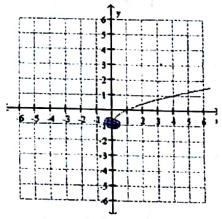
A. 1876 B. 1890 C. 1976 D. never

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

reflect

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 gra… 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∞)

D) Domain $[0, \infty)$ Range $[0, \infty)$

(0,-1) min. point

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

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

b. $x = 2$ or $x = -4$

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

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

$3x+5=-1$ or $3x+5=1$

$-5\ \ -5$ $\quad$ $-5\ \ -5$

$3x=-6$ $\quad$ $3x=-4$

$x=-2$ $\quad$ $x=-4/3$

Free Response:

1)

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

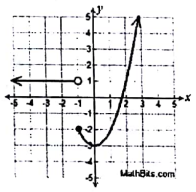
Find each of the following

f(7x) $2(7x)+1$ $14x+1$	h(-10) 5	(b + c)(x) $x^2+3x-10$ $+4x$ $x^2+7x-10$	$\left(\frac{g}{h}\right)(x) = \frac{15x^2}{5}$ $3x^2$	f(g(x)) $2(15x^2)+1$ $30x^2+1$
$f^{-1}(x)$ $\frac{x-1}{2}$	g(c(2)) $g(4(2))$ $g(8)$ $15(8)^2$ 960	b(x) – c(x) $x^2+3x-10$ $-4x$ x^2-x-10	$g^{-1}(x)$ $\sqrt{\frac{x}{15}}$	$j^{-1}(x)$ $\left(\frac{x-4}{3}\right)^3$

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

Slope Intercept Form	Slope	Y-intercept
$y = -5/2x + 5$	$-5/2$	$(0, 5)$

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



f(1) = -2

f(-1) = -2

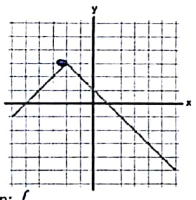
f(-2) = 1

x=1 find y

x=-1 find y (pt 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

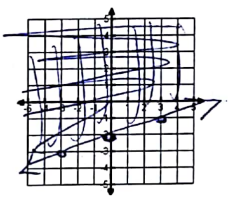
Equation of g(x): $y = -|x+2| + 3$

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

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

State the slope: 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: $q + d = 34$

$.25q + .10d = 6.55$

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

$.25q + .10d = 6.55$

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

$q = 21$

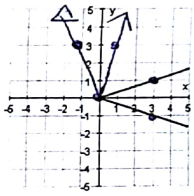
$21 + d = 34$

$-21 \quad -21$

$d = 13$

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

$f(x) = x + 1 \quad g(x) = 2x$

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.

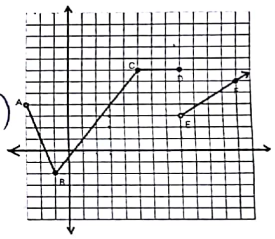
a. $g(3) = 4$

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

c. $g(-3) =$ 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.

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