Student: ______________________ **Instructor:** **Mary Robertson** **Date:** Oct 19 – 20, 2017

Course: MAC 1105 College Algebra *Practice Test* **Assignment:** Test #3, Module 3 (3.1 – 3.6) **Part 1**

I pledge that I will not use any notes, text, or other reference materials (including using computers, cell phones, etc...) during this test. I pledge that I will neither give nor receive any aid from any other person, and that the work presented is entirely my own. I pledge that I will not reveal the contents of the test to any other person.

______________________________ Signature

______________ Date

Given: {(7, 2), (9,3), (3, 8), (5, 9), (3, 1)}

1. (a) Is the given relation also a function? State **YES** or **No** and **WHY** or **WHY NOT – BE SPECIFIC.**

   The points (3, 8) & (3, 1) have one x going to 2 different ys.

   (b) List the elements of the domain: {7, 9, 5, 3}

   (c) List the elements of the range: {1, 2, 3, 8, 9}

2. Evaluate the following function at for $x = \cancel{436}$ (81) and for $x = x + h$. All answers must be simplified.

$$g(x) = 2\sqrt{x} - 3x$$

$$g(81) = 2\sqrt{81} - 3(81)$$
$$= 2(9) - 3(81)$$
$$= 18 - 243$$
$$= -225$$

   (a) $g(81) =$ -225

   (b) $g(x+h) =$ $2\sqrt{x+h} - 3x - 3h$

3. Determine the difference quotient $\left(\frac{f(x+h)-f(x)}{h}\right)$ for $f(x) = x^2 - 3x$ $\qquad \frac{f(x+h)-f(x)}{h} =$ $2x + h - 3$

$$f(x+h) = (x+h)^2 - 3(x+h)$$
$$= x^2 + 2xh + h^2 - 3x - 3h$$

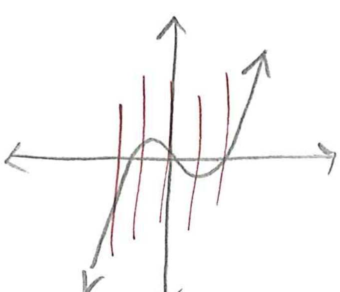
$$\frac{(\cancel{x^2} + 2xh + h^2 - \cancel{3x} - 3h) - (\cancel{x^2} - \cancel{3x})}{h}$$

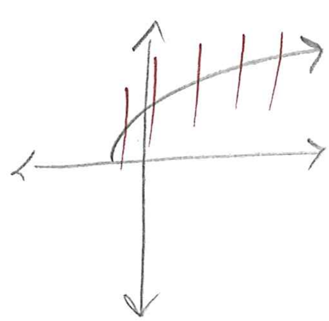
$$\frac{2xh + h^2 - 3h}{h}$$

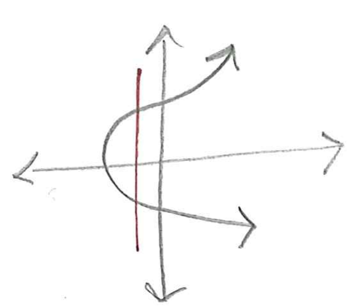
$$2x + h - 3$$

4. Use the Vertical Line Test to determine if the following graphs are functions. State **YES** or **NO** in the blanks provided.

   (a) Yes (b) Yes (c) No







5. Find the x-intercept(s) and the y-intercept of the function. If the intercepts do not exist, write **NONE.**

Write as ordered pairs.

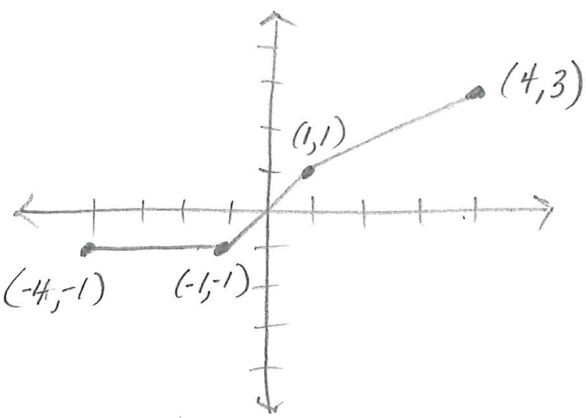
$$f(x) = x^2 - 2x - 3$$

y-intercept
$(x=0)$
$f(0) = 0^2 - 2(0) - 3$
$f(0) = -3$
$(0,-3)$

x-intercept
$f(x) = 0$
$x^2 - 2x - 3 = 0$
$(x-3)(x+1) = 0$
$x = 3, -1$
$(3,0)$ & $(-1,0)$

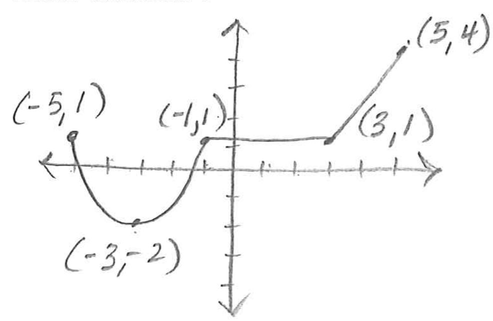
(a) x-intercepts: $(3,0)$ & $(-1,0)$ (b) y-intercept: $(0,-3)$

6. Use the graph below given to determine the domain and range of the function.



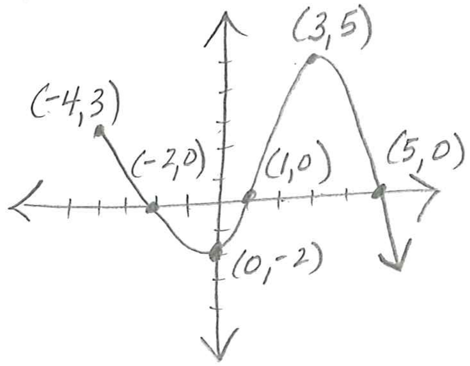
(a) Domain: $[-4, 4]$ (b) Range: $[-1, 3]$

7. Determine the interval(s) for which the graphed function below is (a) increasing, (b) decreasing and (c) constant. Write your answer using interval notation. If the function does not increase, does not decrease, or is not constant, then write your answer as "never increasing", or "never decreasing" or "never constant".



(a) $(-3,-1), (3,5)$ (b) $(-5,-3)$ (c) $(-1,3)$

8. Use the given graph to answer the following questions. If an answer doesn't exist, write "**NONE**".



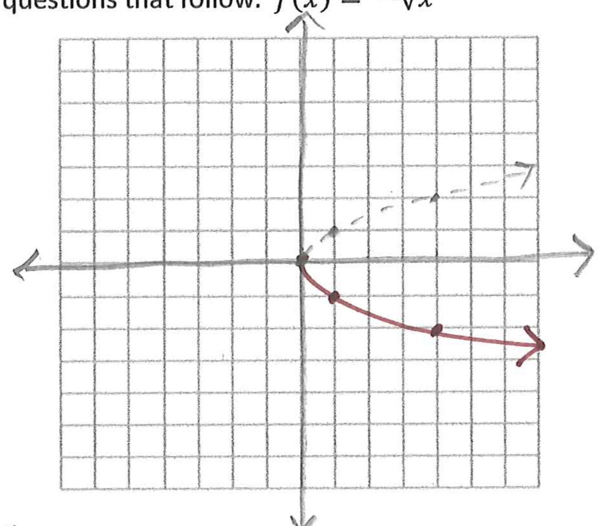
(a) The value(s) of x where the function has a relative minimum. 0

(b) The value(s) of x where the function has a relative maximum. 3

(c) The relative minimum value(s) -2

(d) The relative maximum value(s) 5

9. Sketch the graph of the function and answer the questions that follow. $f(x) = -\sqrt{x}$



a. Is the function even, odd or neither. Verify your answer.

$f(x) = -\sqrt{x}$ $\quad$ $f(x) \neq f(-x) \rightarrow$ not even

$f(-x) = -\sqrt{-x}$ $\quad$ $f(-x) \neq -f(x) \rightarrow$ not odd

$-f(x) = \sqrt{x}$ $\quad$ $\therefore$ neither

b. For what values of *x* is the function increasing, decreasing or constant? **Answer in Interval Notation.**

Increasing none $\quad$ decreasing $(0, \infty)$ $\quad$ constant none

c. What is the domain and range of the function? **Answer in Interval Notation.**

Domain $[0, \infty)$ $\quad$ Range $(-\infty, 0]$

10. Graph the piecewise-defined function given below, then answer the following questions.

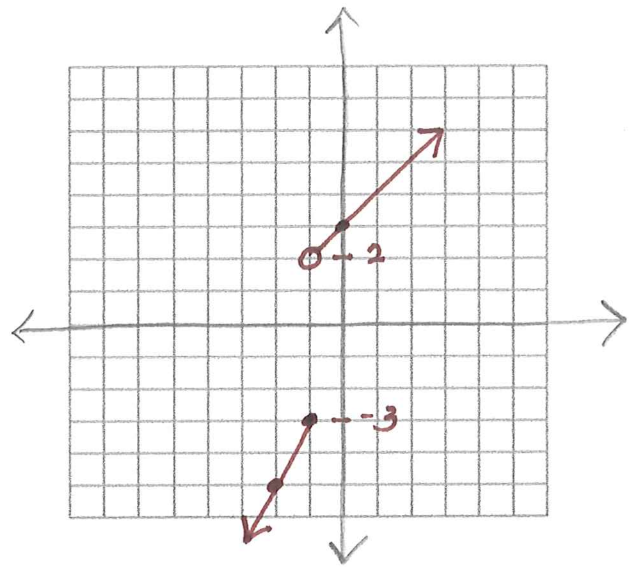
$$f(x) = \begin{cases} 2x - 1 \ \ if\ x \le -1 \\ x + 3 \ \ if\ x > -1 \end{cases}$$

$f(x) = 2x - 1$

x	y
-1	-3
-2	-5

$f(x) = x + 3$

x	y
-1	2 (open dot)
0	3



Evaluate:

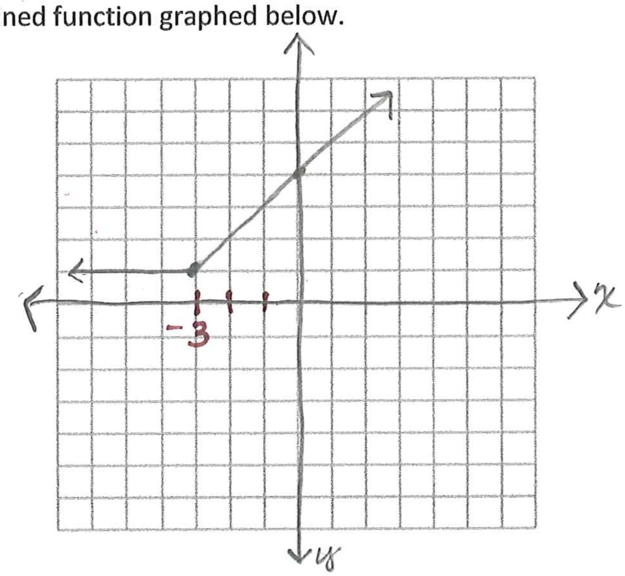
(a) f(1) = 4 (b) f(-1) = -3 (c) f(2) = 5

(d) What is the domain of the function? $(-\infty, \infty)$

(e) What is the range of the function? $(-\infty, -3] \cup (2, \infty)$

11. Give the rule (write the equations) that describes the piecewise-defined function graphed below.

$$f(x) = \begin{cases} 1 \ \ if\ x < -3 \\ x + 4 \ \ if\ x \ge -3 \end{cases}$$

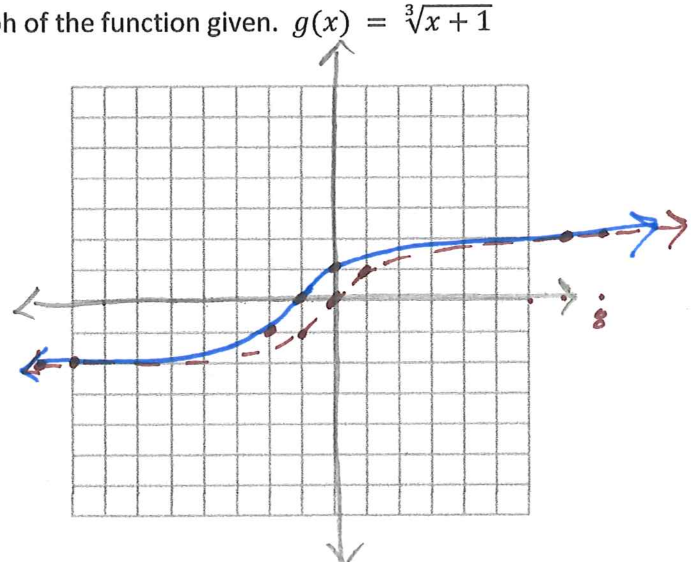


12. Use the graph of a known basic function to sketch the graph of the function given. $g(x) = \sqrt[3]{x+1}$

parent function

$y = \sqrt[3]{x}$

x	y
0	0
1	1
~~8~~	~~2~~
-1	-1
~~-8~~	~~-2~~



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Course: MAC 1105 College Algebra **Assignment:** Test #3, Module 3 (3.1 – 3.6) **Part 2**

13. Use the graph of a known basic function to sketch the graph of the function given. $h(x) = -(x+2)^2 - 1$

parent function

$y = x^2$

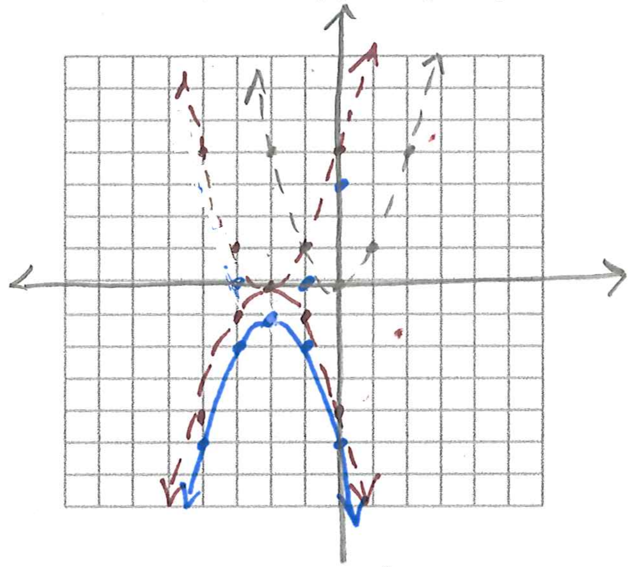
x	y
0	0
1	1
2	4
-1	1
-2	4

1st move 2 left

2nd reflect over x-axis

3rd move 1 down

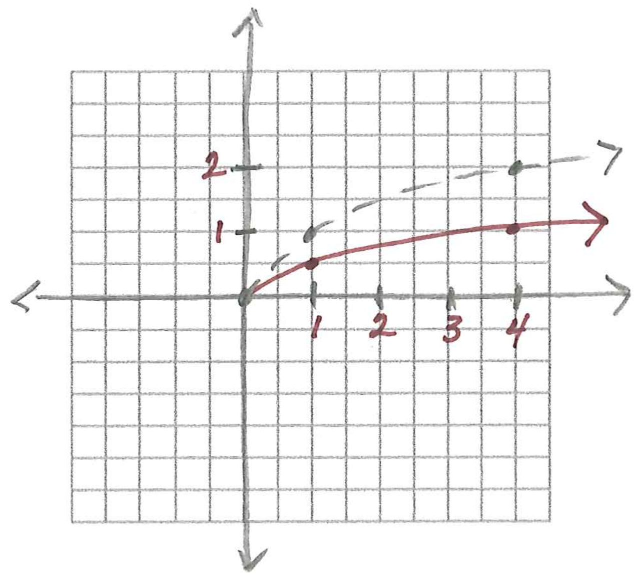
The final graph is in blue.



14. Use the graph of a known basic function to sketch the graph of the function given. $g(x) = \frac{1}{2}\sqrt{x}$

Then fill in the blanks below.

The graph of $g(x) = \frac{1}{2}\sqrt{x}$ is a vertical (a) compression of the basic function g(x) = (b) $\sqrt{x}$ by a factor of (c) $\frac{1}{2}$.



15. Use the graph of a known basic function and a combination of transformations to sketch the function.

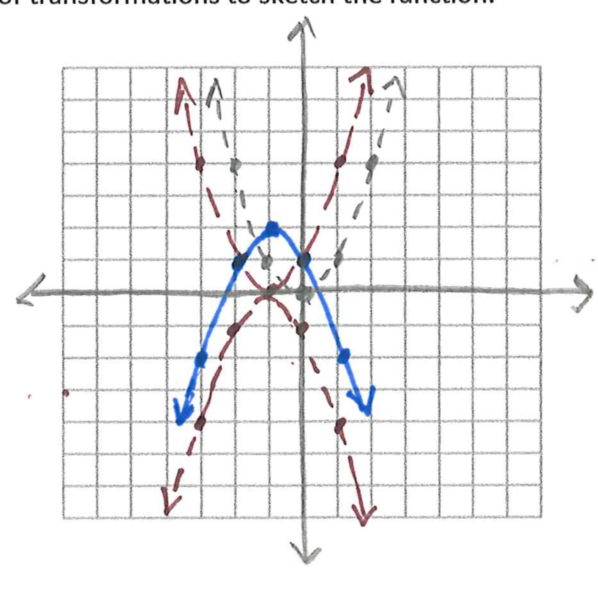
$$h(x) = -(x+1)^2 + 2$$

1st left 1 unit

2nd reflect over x-axis

3rd up 2 units

The final graph is in blue.



16. For the pair of functions defined, find $f-g$ and $\frac{f}{g}$. Give the domain of each.

$\frac{x^2-3x+7}{7x+10}$ $x \neq \frac{-7}{10}$

$f(x) - g(x)$

$(x^2-3x+7)-(7x+10)$

$f(x) = x^2 - 3x + 7, \qquad g(x) = 7x + 10$

(a) $(f-g)(x) =$ $x^2-10x-3$

(b) $\left(\frac{f}{g}\right)(x) =$ $\frac{x^2-3x+7}{7x+10}$ $x \neq \frac{-7}{10}$

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

Domain: $\left(-\infty, \frac{-7}{10}\right) \cup \left(\frac{-7}{10}, \infty\right)$

17. Given $f(x) = -\frac{10}{x-2}$ and $g(x) = \sqrt{x+13}$ Evaluate $(fog)(3)$. ~~Type~~ Write an exact answer using radicals as needed.

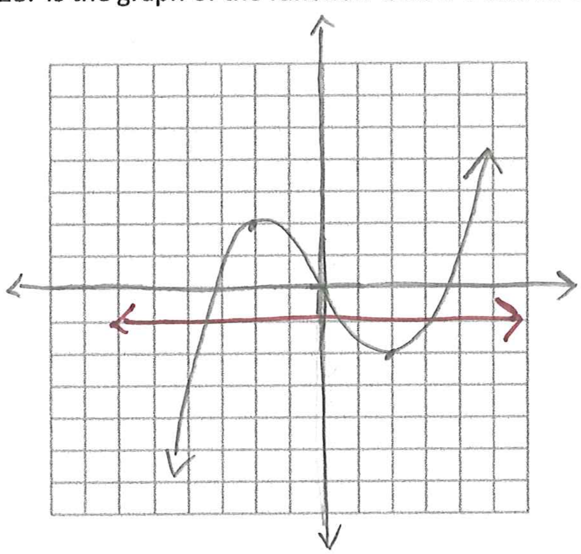
$g(3) = \sqrt{3+13}$
$= \sqrt{16}$
$= 4$

$f(4) = \frac{-10}{4-2}$
$= \frac{-10}{2}$
$= -5$

$\boxed{(f \circ g)(3) = -5}$

18. Is the graph of the function below a one-to-one function? **YES** or **No** (Circle one). State **WHY** or **WHY NOT**.

It fails the horizontal line test.



19. Determine whether ***f*** and ***g*** are inverse functions by evaluating $(fog)(x)$ and $(gof)(x)$.

$f(x) = \frac{2}{3}x - 5$ and $g(x) = \frac{3x-15}{2}$

(a) What is $(fog)(x)$? $x-10$

$(f \circ g)(x) = \frac{\cancel{2}}{3}\left(\frac{3x-15}{\cancel{2}}\right) - 5$

$= x - 5 - 5$

$= x - 10$

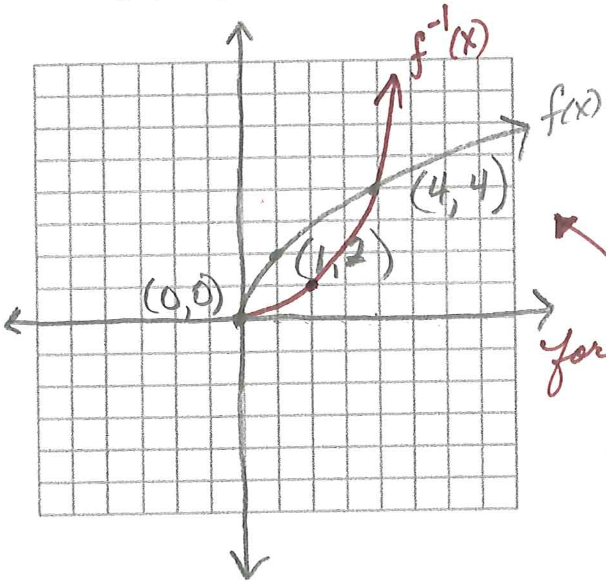
(b) What is $(gof)(x)$? $x-15$

$g \circ f(x) = \frac{3\left(\frac{2}{3}x-5\right)-15}{2}$

$= \frac{2x-15+15}{2} = \frac{2x-30}{2} = x-15$

(c) Are f(x) and g(x) inverse functions? **YES** or **NO** (Circle one)

20. Use the graph of f to sketch the graph of f^{-1}.



for f^{-1} switch the ordered pairs

(0,0)
(2,1)
(4,4)

21. The function $f(x) = \frac{1}{3}x + 2$ is a one-to-one function.

Find $f^{-1}(x) =$ $3x - 6$

Simplify your answer. Use integers or fractions as needed.

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

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

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

$3(x-2) = y$

$\boxed{3x - 6 = f^{-1}(x)}$

22. Evaluate $(gf)(11)$ given that $f(x) = \sqrt{x+5}$ and $g(x) = x^2 + 2$.

$f(11) = \sqrt{11+5}$ $\quad g(11) = 11^2 + 2$

$= 4$ $\quad = 123$

$(g \cdot f)(11) = 123 \cdot 4 = \boxed{492}$

23. Write an equation for the inverse of the given one-to-one function. $g(x) = \sqrt[3]{3x-8}$ Simplify your answer.

Use integers or fractions as needed. $g^{-1}(x) =$ $\frac{x^3+8}{3}$

$y = \sqrt[3]{3x-8}$

$x = \sqrt[3]{3y-8}$

$x^3 = 3y - 8$

$x^3 + 8 = 3y$

$\frac{x^3+8}{3} = g^{-1}(x)$

24. Given the graph of f(x) below, graph f(x – 2) + 3 on the same coordinate grid.

(−5, −3)
(−2, 1)
(2, 1)
(4, 3)

inverse ordered pairs

(−3, −5)
(1, −2)
(1, 2)
(3, 4)