

Name: \_\_\_\_\_

Student #: \_\_\_\_\_

Date: \_\_\_\_\_

T.A. #: \_\_\_\_\_

## Mathematics 12 Pre-Calculus LEARNING GUIDE 2 TEST – TRANSFORMATIONS

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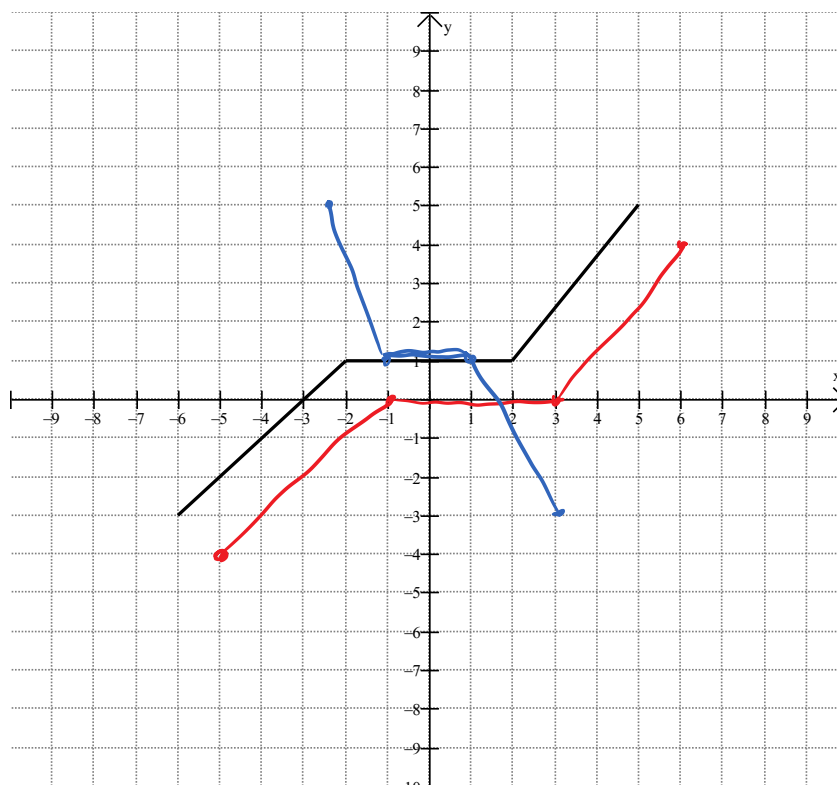
**\*Full marks may NOT be given for the final answer only.**

When using a calculator, you should provide a decimal answer that is correct **to at least two decimal places** (unless otherwise indicated). Such rounding should occur **only** in the final step of the solution.

1. Using the graph of  $y = f(x)$  below, sketch and label the graphs of: (2 marks)

a)  $f(x - 1) - 1$  —

b)  $f(-2x)$  —



2. Give the location of any invariant point(s) in the transformations you did in #1b. (1 mark)

(0, 1)

/3

3. Describe what happens to the graph of a function if you make each change to its equation:

(2 marks each)

- a) replace  $y$  with  $-y$ , then replace  $x$  with  $x - 4$ .

REFLECT IN  $x$ , RIGHT 4

- b) replace  $x$  with  $x + 1$  and  $y$  with  $y + 5$ .

LEFT 1 DOWN 5

- c) replace  $x$  with  $2x$  and  $y$  with  $\frac{1}{3}y$ .

HC BAFD  $\frac{1}{2}$  VE BAFD 3

- d) replace  $x$  with  $-\frac{1}{2}x$  and  $y$  with  $3y$ , then  $y$  with  $y + 1$

REFLECT  $y$ , HE BAFD 2, VC BAFD  $\frac{1}{3}$ , DOWN 1

4. Describe what happens to the equation of a function if you make each change to its graph:

(2 marks each)

- a) reflect the graph about the line  $y = x$ .

$x$  AND  $y$  SWITCHED

- b) stretch (expand) vertically by a factor of 3 and then move down 3.

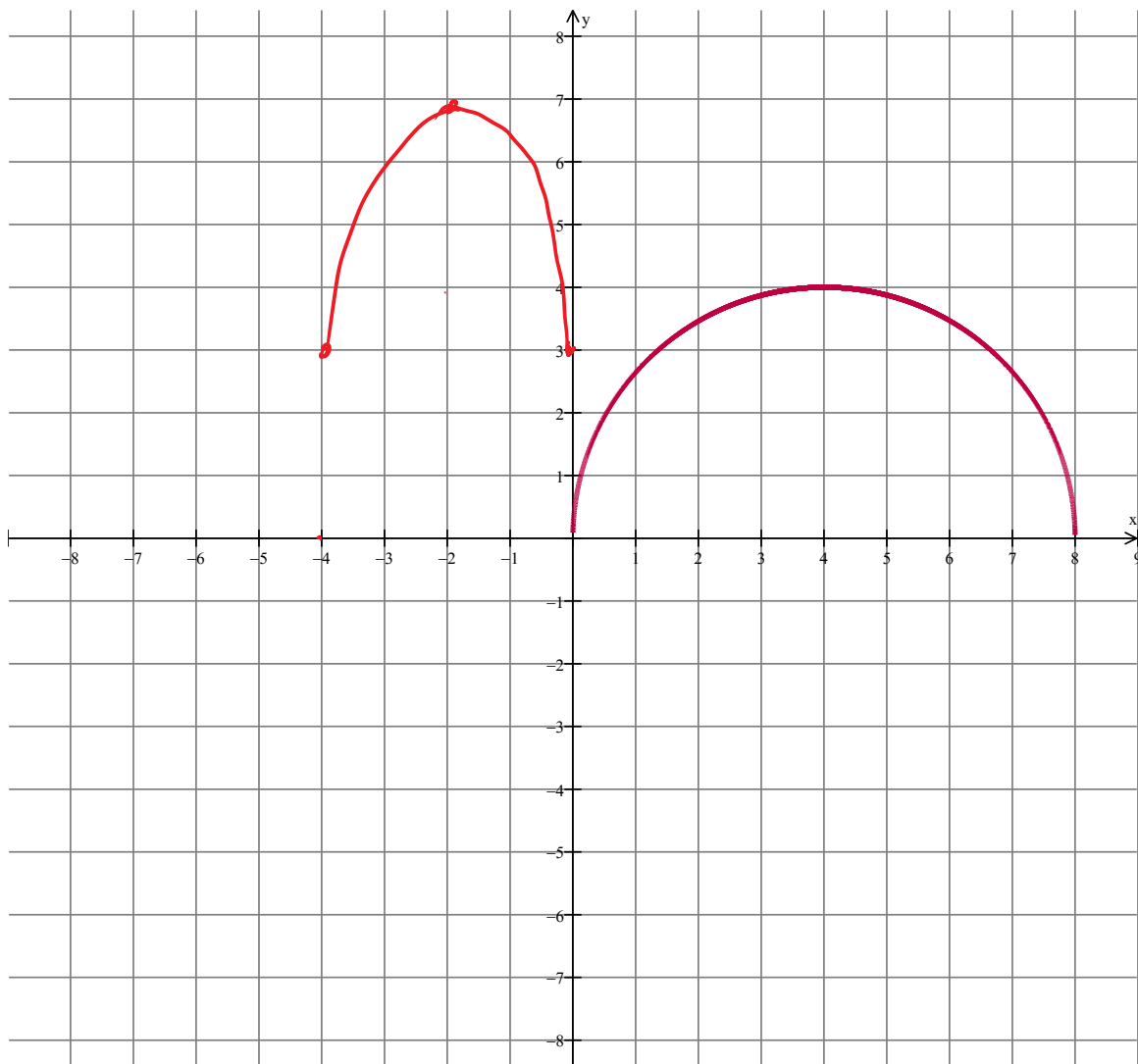
$y \rightarrow \frac{1}{3}y$        $y \rightarrow y + 3$   
or       $y = 3f(x) - 3$

- c) stretch (compress) vertically by a factor of  $\frac{1}{5}$  and translate 2 units right.

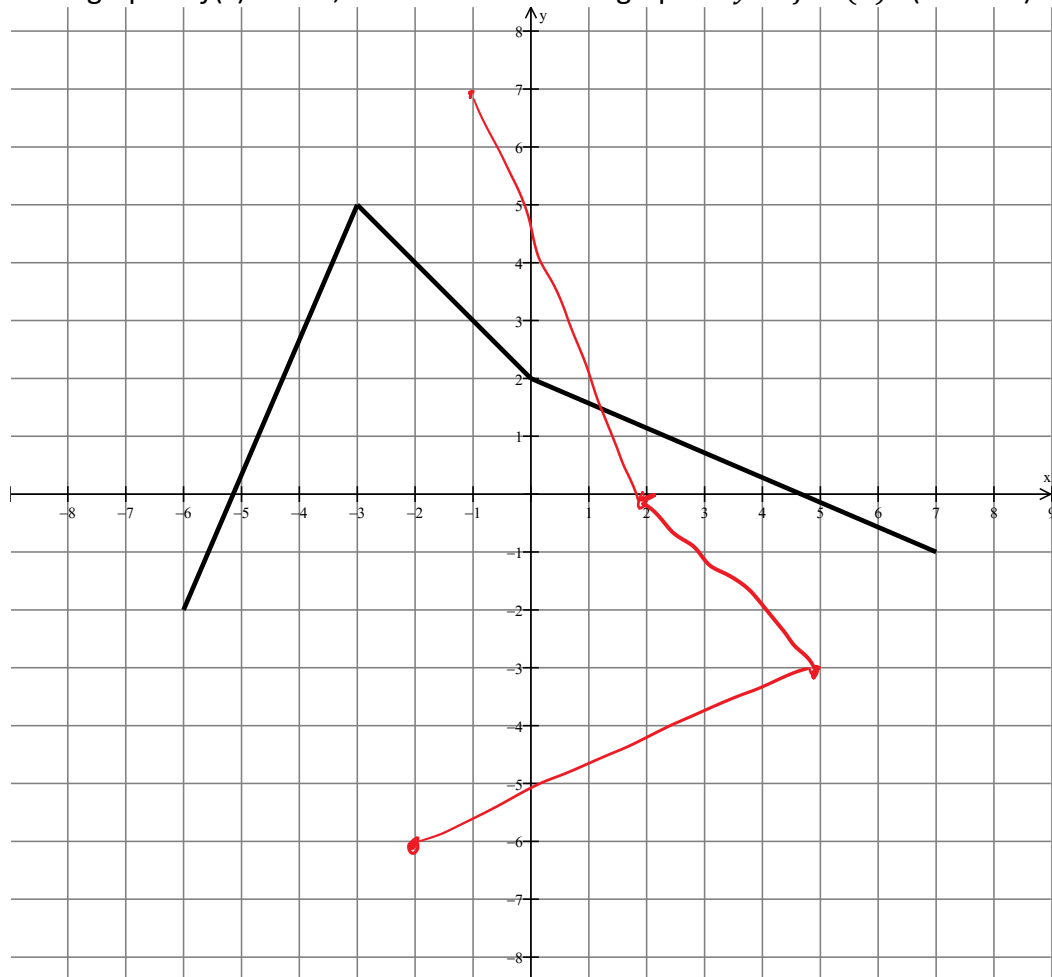
$$y \rightarrow 5y \quad x \rightarrow x-2$$

$$\text{or } y = \frac{1}{5} f(x-2)$$

5. Given the graph of  $y = f(x)$ , sketch the graph of  $y = f(-2x) + 3$ . (2 marks)



6. a) Given the graph of  $f(x)$  below, sketch and label the graph of  $y = f^{-1}(x)$ . (3 marks)



- b) How do you tell by looking at the graph of  $f(x)$  that the inverse will not be a function? (1 mark)

$f(x)$  DID NOT PASS HORIZONTAL LINE TEST.

- c) How could you restrict the domain of  $f(x)$  so that the inverse would be a function? (1 mark)

POSSIBLE DOMAINS:  $-6 \leq x \leq -3$

$-3 \leq x \leq 7$

$-3 \leq x \leq 0$

$0 \leq x \leq 7$

7. What is the inverse of the relation  $y = \frac{x-2}{3}$ ?

(2 marks)

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

$$3x = y - 2$$

$$y = 3x + 2$$

8. If  $(-6, 3)$  is a point on the graph of  $y = f(x)$ , what must be a point on the graph of  $y = 2f(-x) - 1$ ?

(2 marks)

①  $(-6, 6)$  *VE BAF 2*

②  $(6, 6)$  *REFLECT Y*

③  $(6, 5)$  *DOWN 1*

9. Give the equation of the new relation if the graph of  $y = x^2 - x + 1$  were stretched (expanded) vertically by a factor of 2, stretched (compressed) horizontal by a factor of  $\frac{1}{2}$  and moved down 1. (2 marks)

$$\frac{1}{2}y = x^2 - x + 1$$

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

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

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

$$y+1 = 8x^2 - 4x + 2$$

$$y = 8x^2 - 4x + 1$$