

Grade 11 Pre-AP Functions
Quiz – Unit 1 – Translations, Reflections

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Victim:

Mr. Solutions

Another fine piece of work Mr. N.!!

KU	APP	TIPS	COM
20/20	16/16	5/5	10/10

1. Consider the graph of the function $y = f(x)$ shown below and the function g defined by the equation

$$g(x) = -f(-(x-7)) - 3.$$

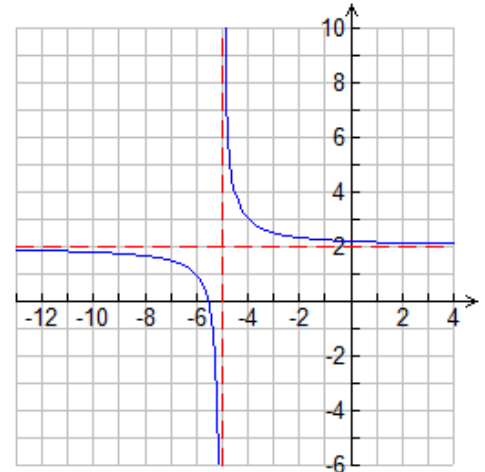
- (a) State an equation of f . (2 KU)

$$f(x) = \frac{1}{x+5} + 2$$

- (b) Write the transformation

$$g(x) = -f(-(x-7)) - 3 \text{ using mapping notation. (2 KU)}$$

$$(x, y) \rightarrow (-x+7, -y-3)$$



- (c) Describe the transformation in words. (4 KU)

Horizontal

1. Reflect in y -axis

Vertical

1. Reflect in x -axis

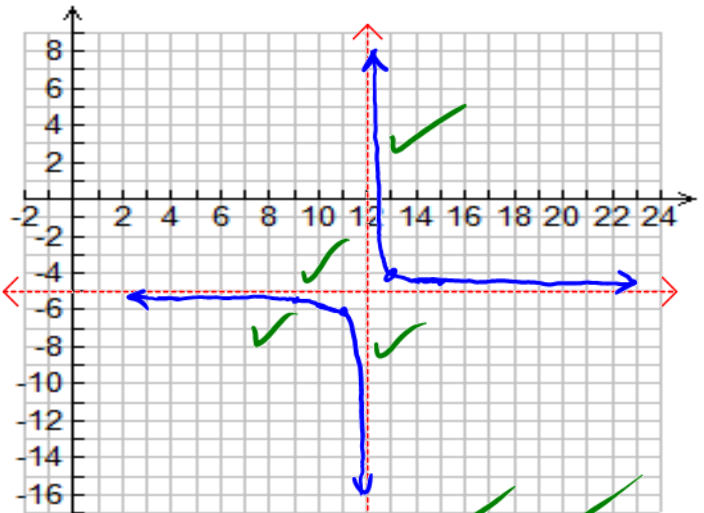
2. Translate 7 right

2. Translate 3 down

- (d) Apply the transformation to the four key points on f given in the table as well as to the asymptotes of f . (6 KU)

Pre-Image	Image
$(-4, 3)$	$(-(-4)+7, -3-3) = (11, -6)$
$(-6, 1)$	$(-(-6)+7, -1-3) = (13, -4)$
$(-8, \frac{5}{3})$	$(-(-8)+7, -\frac{5}{3}-3) = (15, -\frac{14}{3})$
$(-2, \frac{7}{3})$	$(-(-2)+7, -\frac{7}{3}-3) = (9, -\frac{16}{3})$
$y = 2$	$y = -2-3 = -5$
$x = -5$	$x = -(-5)+7 = 12$

- (e) Sketch the graph of $y = g(x)$. In addition, state an equation of g based on your graph. (6 APP)



Equation of g : $g(x) = \frac{1}{x-12} - 5$

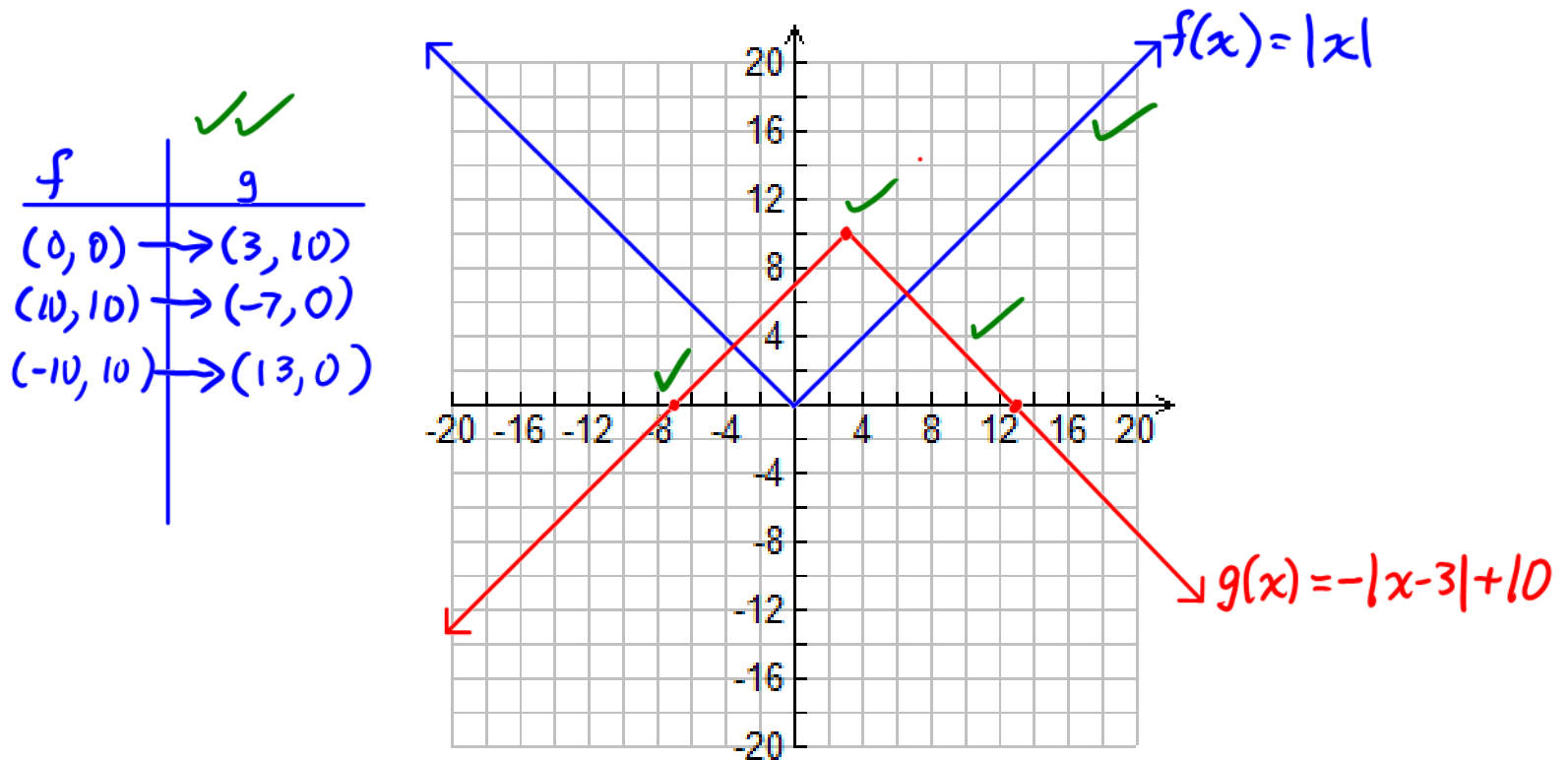
- (f) Use an algebraic method to confirm that the equation you stated in (e) is correct. (4 APP)

$$\begin{aligned}
 g(x) &= -f(-(x-7)) - 3 \\
 &= -\left[\frac{1}{-(x-7)+5} + 2\right] - 3 \\
 &= \frac{-1}{-x+7+5} - 2 - 3 \\
 &= \frac{-1}{-x+12} - 5 \\
 &= \frac{-1}{-1(x-12)} - 5 \\
 &= \frac{1}{x-12} - 5
 \end{aligned}$$

2. Consider the function f defined by the equation $f(x) = |x|$. The function g is obtained by performing the following transformations to f :

Horizontal Transformations	Vertical Transformations
1. Reflect in the y-axis 2. Translate three units to the right	1. Reflect in the x-axis 2. Translate 10 units up

(a) Write the transformation using function notation. (2 KU) $g(x) = -f(-(x-3)) + 10$	(b) Write the transformation using mapping notation. (2 KU) $(x, y) \rightarrow (-x+3, -y+10)$
(c) Write the equation of g using absolute value notation. (2 KU) $g(x) = - -(x-3) + 10$ $= - x-3 + 10$	(d) On the given grid, sketch the graphs of both f and g. The graph of g should be generated entirely by using the given transformations. Do not use a table of values! (6 APP)



3. Suppose that $g(x) = f(-x+7)$. Explain why the graph of g can be obtained by using **either** of the following sets of transformations given below. Illustrate your answer with a graph. (5 COM, 5 TIPS)

Transformation 1
1. Translate seven units to the left 2. Reflect in the y-axis

Transformation 2
1. Reflect in the y-axis 2. Translate seven units to the right

You may write your answer on the back of this sheet.

(T1)

f 's input	g 's input
$-x+7$	x

To transform $-x+7$ to x , first 7 must be subtracted, then the result is divided (or multiplied) by -1 . This corresponds to transformation 1. ✓

$g: x$	x
$\downarrow$	$\uparrow$
$x(-1)$	$\div (-1)$
$\downarrow$	$\uparrow$
$+7$	-7
$\downarrow$	$\uparrow$
$f: -x+7$	$-x+7$

Ⓙ To understand transformation 2, it is only necessary to rewrite $-x+7$ as $-(x-7)$:

f's input	g's input
$-(x-7)$	x

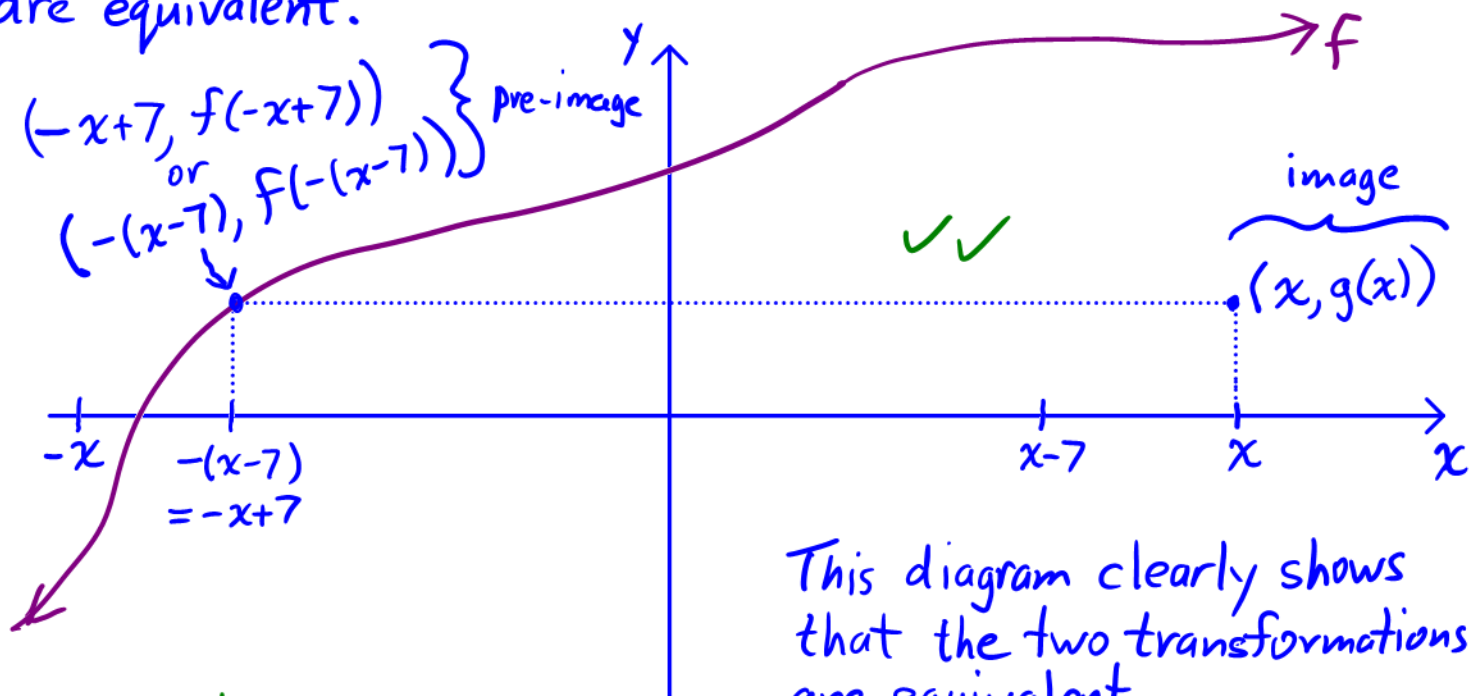
To transform $-(x-7)$ to x , first divide (or multiply) by -1 , then add 7 to the result. This corresponds to transformation 2. ✓✓

g: x	x
$\downarrow$	$\uparrow$
-7	$+7$
$\downarrow$	$\uparrow$
$x(-1)$	$\div(-1)$
$\downarrow$	$\uparrow$
f: $-(x-7)$	$-(x-7)$

Using mapping notation, transformations 1 and 2 can be described as follows:

Transf.	Pre-image (on f)	Image (on g)
1	$(x, y) \rightarrow (-(x-7), y)$	
2	$(x, y) \rightarrow (-x+7, y)$	

Notice that when $-(x-7)$ is simplified, the resulting expression is $-x+7$. This shows that the two transformations are equivalent.



This diagram clearly shows that the two transformations are equivalent.

COM Marks:

- 1-2 → explanation very weak and/or contains many irrelevant points
- 3-4 → explanation good or very good, most points covered
- 5 → explanation excellent, thorough