MCR 3U9 **Semester 1, 2015 - 2016**

Grade 11 Pre-AP Functions
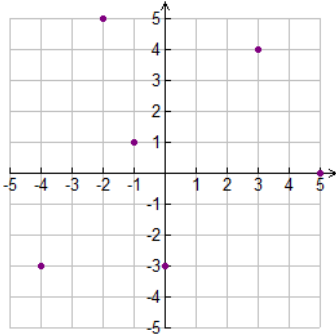## Unit 1 – Major Test 1 – Functions, Relations and Transformations
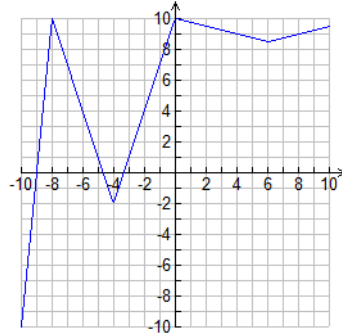
Mr. N. Nolfi

Victim: _____

KU	APP	TIPS	COM
/20	/25	/16	/10

1. Study each graph carefully and then answer the questions found immediately below the graphs. **(20 KU)**
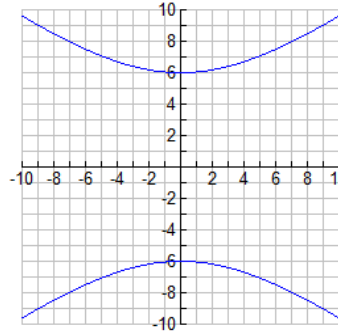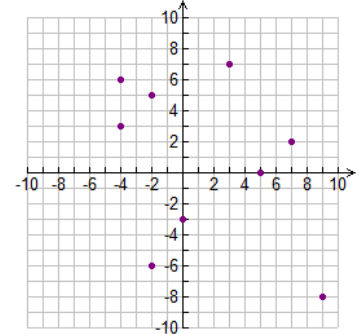
(i)   (ii)   (iii)   (iv)

(a) Which of the above relations are continuous? _____

(b) Which of the above relations are functions? _____

(c) One of the above relations is a discrete function. Write the function as a set of ordered pairs.

_____

(d) One of the above discrete relations *is not* a function. Write a mapping diagram for this relation.

(e) Suppose that the continuous function given above is called *f*. Evaluate each of the following.

$f(0) =$ _____	$f(a) = 1 \quad \therefore a =$ _____
$f(3) =$ _____	$f(-b) = 0 \quad \therefore b =$ _____
$f(-4) =$ _____	$f(3-5) =$ _____

2. State whether each of the following is true or false. Provide an explanation to support each response. **(8 TIPS)**

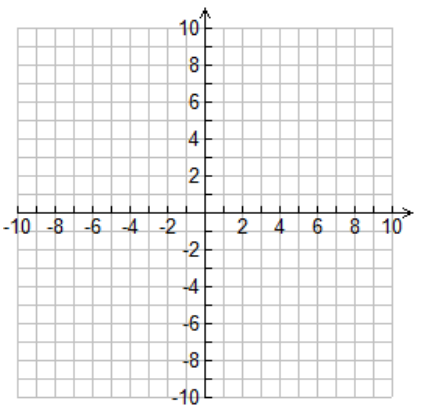| Statement	True or False?	Explanation
For all functions f and all real numbers u and c, $f(u+c) = f(u) + f(c)$		
The equation $\dfrac{x^2}{16} + \dfrac{y^2}{9} = 1$ describes a function.		

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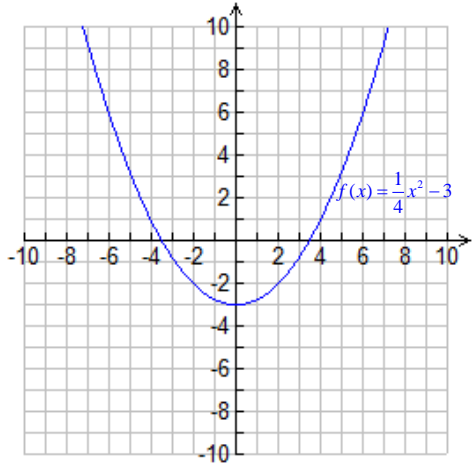
Statement	True or False?	Explanation
For the function $g(x) = \sqrt{x+3} - 5$, $\quad D = \{x \in \mathbb{R} : x \geq -3\}$ and $\quad R = \{y \in \mathbb{R} : y \geq -5\}$. (Here D and R represent domain and range respectively.)		
Suppose that $g(x) = -3f(2x-8)+6$. To obtain the graph of g, the following transformations must be performed to f: • Vertical stretch by a factor of -3 followed by a shift up by 6 units • Horizontal compression by a factor of $1/2$ followed by a shift 8 units right.		

3. Complete the following table. **(5 APP)**

Pre-image	$(2, -3)$	**Transformation in Mapping Notation**		**Graph**	
Transformation	**Horizontal** 1. Stretch by a factor of -3. 2. Translate 4 units right **Vertical** 1. Reflect in the x-axis. 2. Translate down 1 unit.	**Image**			

4. Complete the following table. **(8 APP)**

Equation of Pre-image Function	Transformation	Equation of Image Function	Graph of $y = g(x)$
$f(x) = \dfrac{1}{4}x^2 - 3$	**Verbal** **Function Notation** $g(x) = -2f(4(x-1)) + 3$ **Mapping Notation**		

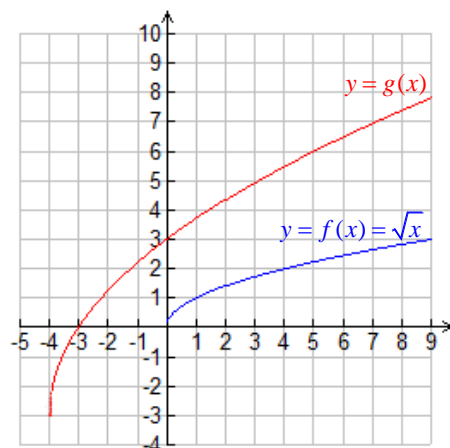| KU	APP	TIPS	COM
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5. The graph of $y = g(x)$ is a transformation of the graph of $y = f(x) = \sqrt{x}$

   (a) Using both *function notation* and *mapping notation*, state how $y = f(x) = \sqrt{x}$ can be transformed into $y = g(x)$. **(4 APP)**

$$g(x) = \underline{\hspace{1cm}} \ f(\ \underline{\hspace{3cm}}\ ) \ \underline{\hspace{2cm}}$$
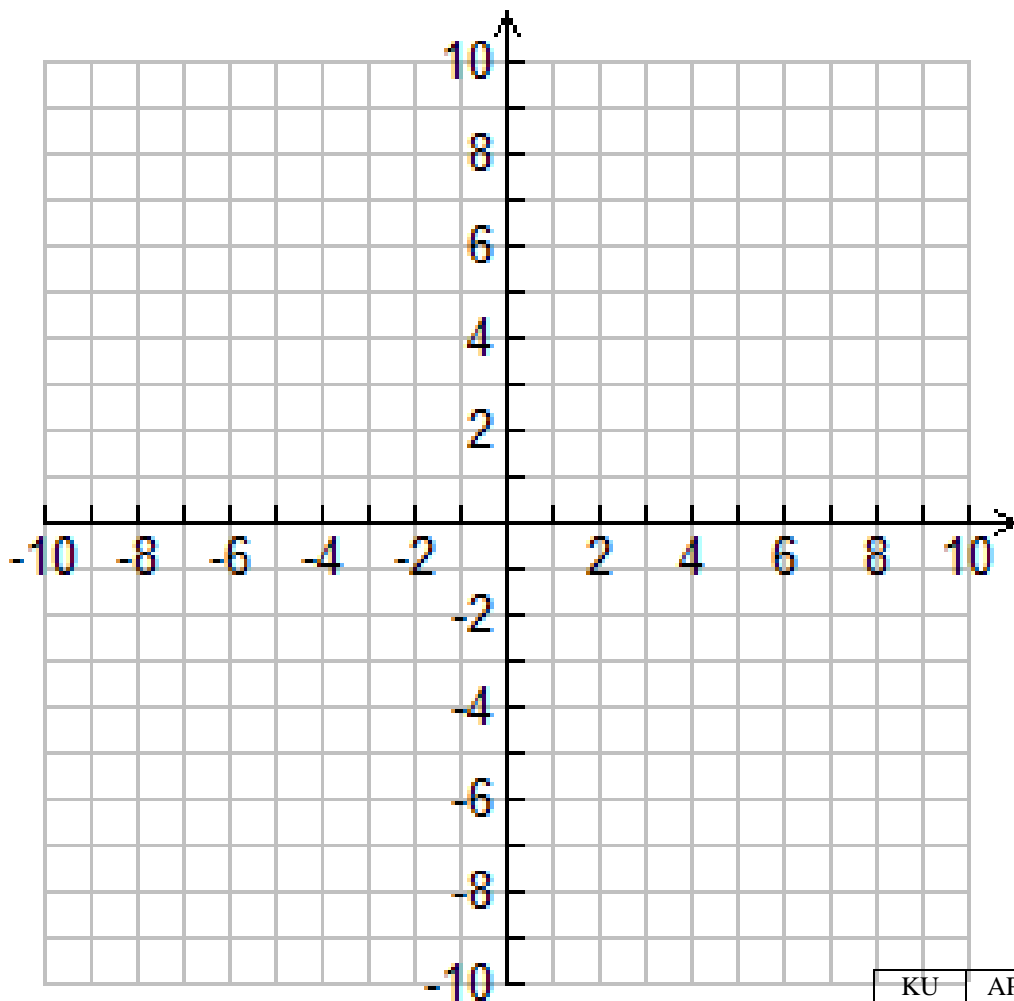
$$(x,\ y) \to (\ \underline{\hspace{3cm}}\ ,\ \underline{\hspace{3cm}}\ )$$

   (b) State an equation of g. **(2 APP)**

   (c) State the domain and range of g. **(2 APP)**

6. Sketch the graphs of $y = (x+1)^2$ and $y = -\dfrac{1}{2}(x+1)^2 - 3$ on the same set of axes. **(4 APP)**

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7. In an attempt to reduce the amount of noise in room 224, Mr. Nolfi decided to give his most talkative student a surprise "gift," a beautifully decorated box containing a cork pacifier. Unbeknown to the student, the box was fitted with a spring-loaded device that was designed to launch the cork vertically upwards upon raising of the box's lid.

Mr. Nolfi tested two different springs to see which would perform better. The results of his experiment are listed below. In each case, the function gives the height of the cork above the ground in metres, t seconds after the box's lid is raised.

Spring 1	Spring 2
$h_1(t) = -4.9t^2 + 5t$	$h_2(t) = -4.9t^2 + 7t$

(a) The most talkative student, _____ , is about 1.7 m tall. Assuming that the box rests on the ground when the lid is raised by _____ and that he/she is standing upright, which spring would have a better chance of launching the cork directly into his/her mouth? **(4 TIPS)**

(b) How can the function h_1 be transformed into the function h_2? **(4 TIPS)**

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