

KNOWLEDGE (KU)		135
APPLICATION (AP)		122
THINKING (TI)		123
COMMUNICATION (CO)		Level

Name:

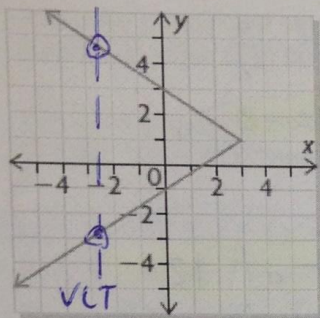
ANSWERS

UNIT 1 TEST: INTRODUCTION TO FUNCTIONS

Knowledge & Understanding (KU)

1. For each relation, determine the domain and range and whether the relation is a function. Explain your reasoning.

a.)

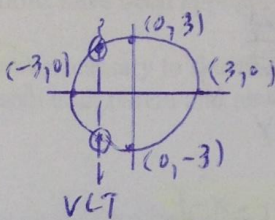


Not a function
fails VLT ✓

$$D = \{x \leq 3 | x \in \mathbb{R}\} \quad \checkmark$$

$$R = \{y \in \mathbb{R}\} \quad \checkmark$$

b.) $x^2 + y^2 = 9$



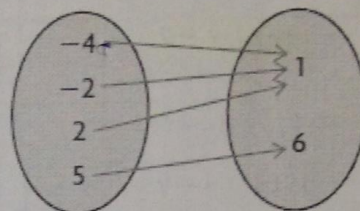
Not a function
fails VLT ✓

$$D = \{-3 \leq x \leq 3 | x \in \mathbb{R}\} \quad \checkmark$$

$$R = \{-3 \leq y \leq 3 | y \in \mathbb{R}\} \quad \checkmark$$

Out of 9

c.)



$$\{(-4, 1), (-2, 1), (2, 1), (5, 6)\}$$

This is a function
x-values don't repeat ✓

$$D = \{-4, -2, 2, 5\} \quad \checkmark$$

$$R = \{1, 6\} \quad \checkmark$$

2. The graphs of $y = f(x)$ and $y = g(x)$ are shown.
Using the graphs, evaluate

a.) $f(1) = 2 \quad \checkmark$

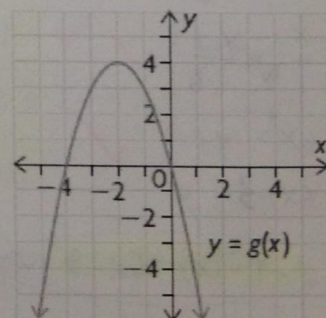
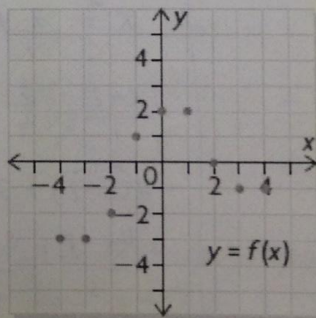
b.) $g(-2) = 4 \quad \checkmark$

c.) $f(4) - g(-2) = -1 - 4 = -5 \quad \checkmark$

d.) x when $f(x) = -3$

$-4 \text{ \& } -3 \quad \checkmark$

Out of 6



3. Consider the functions $f(x) = x^2 - 3x$ and $g(x) = 1 - 2x$.

a.) Show that $f(2) > g(2)$.

b.) Determine $f(3b)$

c.) Determine $g^{-1}(5)$

b.) $f(3b) = (3b)^2 - 3(3b)$ ✓

$f(3b) = 9b^2 - 9b$ ✓

a.) $f(2) = (2)^2 - 3(2)$

$f(2) = 4 - 6$ ✓

$f(2) = -2$ ✓

$g(2) = 1 - 2(2)$ ✓

$g(2) = 1 - 4$

$g(2) = -3$ ✓

$-2 > -3$ ✓

$f(2) > g(2)$ ✓

c.) $g(x) = 1 - 2x$

$y = 1 - 2x$

$x = \frac{1 - y}{2}$ ✓

$\frac{x - 1}{-2} = \frac{-y}{-2}$ ✓

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

$\therefore g^{-1}(x) = \frac{x - 1}{-2}$ ✓

$g^{-1}(5) = \frac{5 - 1}{-2}$ ✓

$g^{-1}(5) = \frac{4}{-2}$

$g^{-1}(5) = -2$ ✓

Out of 12

4. Find the inverse, $f^{-1}(x)$, of each of function defined by the following. Also, state whether or not the inverse is a function or not, and why?

a.) $f(x) = \frac{x + 3}{6}$

$y = \frac{x + 3}{6}$

$x = \frac{y + 3}{6}$ ✓

$6x = y + 3$ ✓

$6x - 3 = y$

$\therefore f^{-1}(x) = 6x - 3$ ✓

$f^{-1}(x)$ is a linear relation and would pass the VLT so it is a function ✓

b.) $f(x) = \frac{3}{4}x + 2$

$y = \frac{3}{4}x + 2$

$x = \frac{4}{3}y + 2$ ✓

$\frac{(x - 2)}{1} = \frac{3y}{4}$

$4(x - 2) = 3y$

$\frac{4x - 8}{3} = \frac{3y}{3}$ ✓

$\frac{4x}{3} - \frac{8}{3} = y$

$f^{-1}(x) = \frac{4x}{3} - \frac{8}{3}$ ✓

$f^{-1}(x)$ is a linear relation and would pass the VLT so it is a function ✓

Out of 8

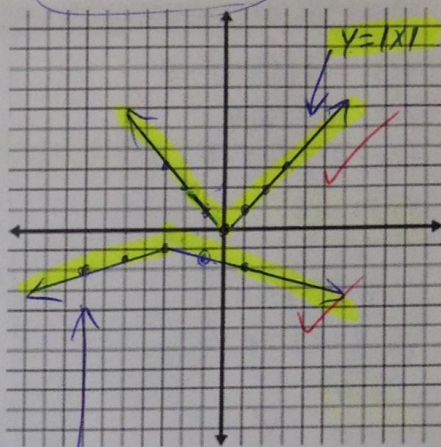
Application (AP)

1. Transformations are applied to the absolute value function $f(x) = |x|$:

- Horizontal stretch by a factor of 2
- Vertical compression by a factor of 0.5
- Reflection about the x-axis
- Translation 3 units left and 1 unit down

$$\begin{aligned} a &= -0.5 \\ k &= \frac{1}{2} \\ c &= -1 \\ d &= -3 \end{aligned}$$

Out of 14



- Write the equation for the final transformed function of $f(x)$.
- State the domain and range, in set notation, of the parent function and the function after all transformations have been applied.
- How can you apply the transformations necessary to sketch the new graph? Show all of your work. (Sketch both parent and new)

a.) $f(x) = -0.5 \left| \frac{1}{2}(x+3) \right| - 1$

b.) $f(x) = |x|$ $D = \{x \in \mathbb{R}\}$ $R = \{y \geq 0 \mid y \in \mathbb{R}\}$

$f(x) = -0.5 \left| \frac{1}{2}(x+3) \right| - 1$ $D = \{x \in \mathbb{R}\}$ $R = \{y \leq -1 \mid y \in \mathbb{R}\}$

$y = -0.5 \left| \frac{1}{2}(x+3) \right| - 1$

c.)

x	y = x
-2	2
-1	1
0	0
1	1
2	2

x	y = -0.5 \left \frac{1}{2}(x+3) \right - 1
$\frac{-2}{0.5} - 3 = -7$	$-0.5(2) - 1 = -2$
$\frac{-1}{0.5} - 3 = -5$	$-0.5(1) - 1 = -1.5$
$\frac{0}{0.5} - 3 = -3$	$-0.5(0) - 1 = -1$
$\frac{1}{0.5} - 3 = -1$	$-0.5(1) - 1 = -1.5$
$\frac{2}{0.5} - 3 = 1$	$-0.5(2) - 1 = -2$

2. The point (10, 18) is on the graph of $y = f(x)$. State the coordinates of the image of this point on each graph.

Out of 8

a.) $y = f\left(\frac{-1x}{2}\right)$

$= \left(\frac{10}{-0.5}, 18\right)$

$= (-20, 18)$

b.) $y = 5f(x)$

$= (10, 5(18))$

$= (10, 90)$

c.) $y = f(x-7)$

$= (10+7, 18)$

$= (17, 18)$

d.) $y = f(x) + 8$

$= (10, 18+8)$

$= (10, 26)$

Thinking & Inquiry (TI)

1. Given the function $f(x) = 3(x - 1)^2 - 4$. Use the equation to determine

a.) $2f(3) - 7$

$$f(3) = 3[(3) - 1]^2 - 4 \checkmark$$

$$f(3) = 3(2)^2 - 4 \checkmark$$

$$f(3) = 3(4) - 4 \checkmark$$

$$f(3) = 8 \checkmark$$

$$\therefore 2f(3) - 7$$

$$= 2(8) - 7 \checkmark$$

$$= 9 \checkmark$$

b.) $f(1 - x)$

$$f(1 - x) = 3[(1 - x) - 1]^2 - 4 \checkmark$$

$$f(1 - x) = 3(-x)^2 - 4 \checkmark$$

$$f(1 - x) = 3x^2 - 4 \checkmark$$

Out of 8

2. Let $f(x) = x^2 - 2x - 15$. Determine the value(s) of x for which

a.) $f(x) = 0$

$$0 = x^2 - 2x - 15 \checkmark \quad p = -15$$

$$0 = (x - 5)(x + 3) \checkmark \quad s = -2$$

$$\begin{array}{l} -3 \times 3 \\ -5 + 3 \end{array}$$

$$x = 5 \quad x = -3 \checkmark$$

b.) $f(x) = -12$

$$-12 = x^2 - 2x - 15 \checkmark$$

$$0 = x^2 - 2x - 15 + 12$$

$$0 = x^2 - 2x - 3 \checkmark \quad p = -3$$

$$0 = (x - 3)(x + 1) \checkmark \quad s = -2$$

$$\begin{array}{l} -3 \times 1 \\ -3 + 1 \end{array}$$

$$x = 3 \quad x = -1 \checkmark$$

Out of 9

3. Given $f(x) = k(2 + x)$, find the value of k if $f^{-1}(-2) = -3$.

$$y = k(2 + x)$$

$$\frac{x}{k} = \frac{k(2 + y)}{k} \checkmark$$

$$\frac{x}{k} = 2 + y \checkmark$$

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

$$\therefore f^{-1}(x) = \frac{x}{k} - 2 \checkmark$$

$$\therefore y = \frac{x}{k} - 2$$

$$y = -3, x = -2$$

$$-3 = \frac{-2}{k} - 2 \checkmark$$

$$-3 + 2 = \frac{-2}{k}$$

$$\frac{-1}{1} = \frac{-2}{k} \checkmark$$

$$\frac{-k}{-1} = \frac{-2}{-1}$$

$$k = 2 \checkmark$$

Out of 6