- approved calculators are permitted
- show work to ensure full marks

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1. Determine the following if $f(x) = \frac{1}{2}x - 4$ and $h(x) = 2x^2 - 4x - 16$

a) $f(68)$

$= \frac{1}{2}(68) - 4$

$= 34 - 4$

$= 30$

b) $f(2m + 8)$

$= \frac{1}{2}(2m+8) - 4$

$= m + 4 - 4$

$= m$

c) $h(-1)$

$= 2(-1)^2 - 4(-1) - 16$

$= 2 + 4 - 16$

$= -10$

d) $h(x - 1)$

$= 2(x-1)^2 - 4(x-1) - 16$

$= 2(x^2 - 2x + 1) - 4x + 4 - 16$

$= 2x^2 - 4x + 2 - 4x + 4 - 16$

$= 2x^2 - 8x - 10$

e) $6f(4) - 2h(0)$

$= 6(\frac{4}{2} - 4) - 2(-16)$

$= 6(-2) + 32$

$= 20$

f) $f \circ f(x)$

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

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

$= \frac{1}{4}x - 2 - 4$

$= \frac{1}{4}x - 6$

g) $h \circ f(8)$

$= h(\frac{8}{2} - 4)$

$= h(0)$

$= -16$

h) Determine $\frac{f(7) - f(-5)}{7 - (-5)}$

$= \frac{1}{2}$

i) Solve for x if $f(x) = 10$

$\frac{1}{2}x - 4 = 10$

$\frac{1}{2}x = 14$

$x = 28$

j) $f^{-1}(x)$

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

switch x and y

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

$x + 4 = \frac{1}{2}y$

$2x + 8 = y$

$f^{-1}(x) = 2x + 8$

k) $f^{-1}(1)$

$= 2(1) + 8$

$= 2 + 8$

$= 10$

l) If $h(x) = f(8)$, solve for x

$2x^2 - 4x - 16 = \frac{1}{2}(8) - 4$

$2x^2 - 4x - 16 = 0$

$2(x^2 - 2x - 8) = 0$

$2(x - 4)(x + 2) = 0$

$x_1 - 4 = 0 \qquad x_2 + 2 = 0$

$x_1 = 4 \qquad x_2 = -2$

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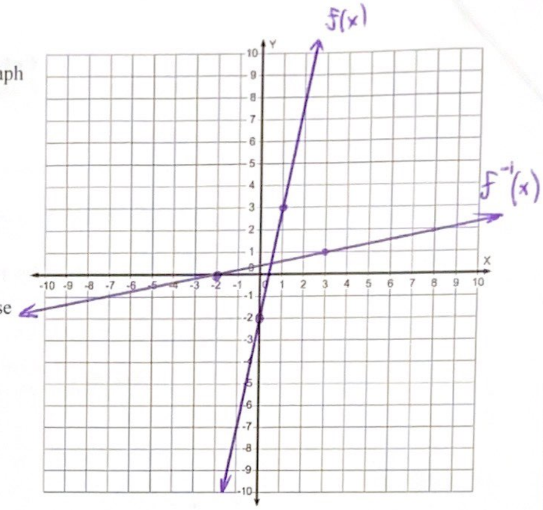
2. a) If $f(x) = 5x - 2$, sketch $f(x)$ and $f^{-1}(x)$ on the same graph



b) How is the slope of a linear relation and the slope of its inverse related to each other?

They are reciprocals of each other

3. For the linear function: $g(x) = 3x - 6$

a) Determine $g(g^{-1}(4))$

$= 4$

b) Determine the point of intersection of $g(x)$ and $g^{-1}(x)$

set $g(x)$ equal to $y = x$

$3x - 6 = x$

$2x = 6$

$x = 3$

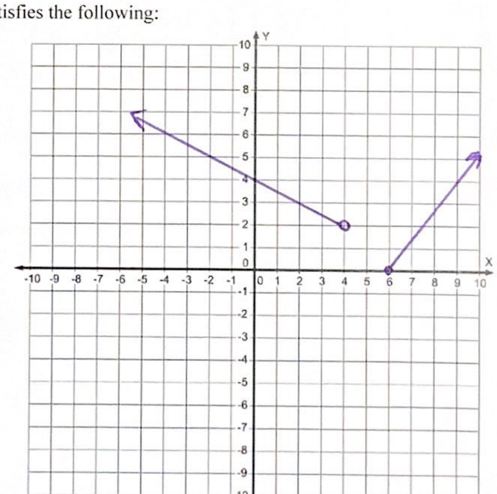
$\therefore$ PoI is $(3, 3)$

4. *If* $y = f(x)$ ***has domain*** $-4 \le x < 2$ ***and range*** $y > 2$, what would be the domain of $f^{-1}(x)$?

5. On the provided grid, sketch a function that satisfies the following:

- domain is $\{x \in R | x < 4 \text{ or } x \ge 6\}$
- range is $\{y \in R | \, y \ge 0\}$
- has only one *y-intercept* at $(0, 4)$

answers will vary



6. Complete the chart below:

Relation	Is it a function? (write Y or N)	Domain	Range
a) $2x + 3y - 4 = 0$	Y	$x \in R$	$y \in R$
b) $y = -2x^2 + 75$	Y	$x \in R$	$y \in R \mid y \le 75$
c) $x^2 + y^2 = 2$	N	$x \in R \mid -\sqrt{2} \le x \le \sqrt{2}$	$y \in R \mid -\sqrt{2} \le y \le \sqrt{2}$

7. Determine the domain and range of $g(x) = -2x^2 + 4x - 5$

$x = \frac{-b}{2a}$ $\qquad$ $y = -2(1) + 4(1) - 5$

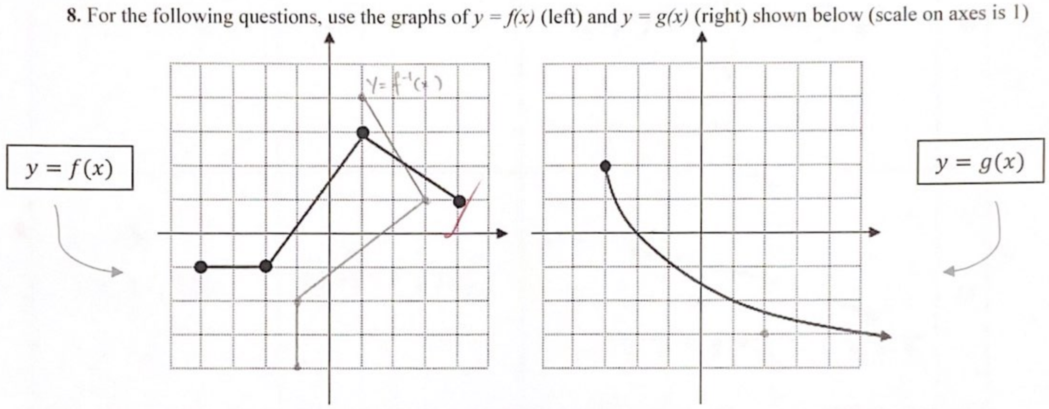
$x = \frac{-4}{-4}$ $\qquad$ $y = -2 + 4 - 5$

$x = 1$ $\qquad$ $y = -3$

3

Domain	*Range*
$\{x \in \mathbb{R}\}$ ✓	$\{y \in \mathbb{R} \mid y \leq -3\}$

8. For the following questions, use the graphs of $y = f(x)$ (left) and $y = g(x)$ (right) shown below (scale on axes is 1)



a) Sketch the inverse of $f(x)$ on the grid above

b) Determine $f(4) + g(0)$

$= 1 + (-1.5)$

$= -0.5$ ✓

c) Determine the value(s) of x such that $f(x) = -1$

$-4 \leq x \leq -2$ ✓

d) Evaluate $g \circ f(4)$

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$= g \circ 1$

$= g(1)$ ✓

$= -2$

e) Determine $f^{-1}(3)$

$f^{-1}(3) = 1$ ✓

f) Evaluate $f \circ f(4)$

$= f(1)$ ✓

$= 3$

g) Determine the range of $g^{-1}(x)$ ✓

$R = \{y \in \mathbb{R} \mid y \geq -3\}$

9. a) State the domain and range of the graph to the right:

Domain	*Range*
$\{x \in \mathbb{R} \mid -3 \leq x < 2\}$	$\{y \in \mathbb{R} \mid -5 < y \leq 2\}$

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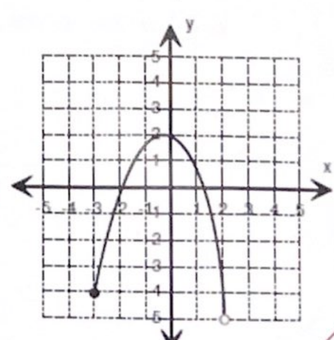
b) Will the inverse of the graph be a function? No ✓



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10. Complete the chart:

	Interval Notation	Set-builder Notation
a)	$x \in (-\infty, -1), x \in \mathbb{R}$	$\{x \in \mathcal{R} \mid x < -1\}$
b)	$x \in (2,3] \cup [4,5), x \in \mathbb{R}$	$\{x \in \mathcal{R} \mid 2 < x \leq 3 \text{ or } 4 \leq x < 5\}$
c)	$x \in [10, \infty), x \in R$	$\{x \in \mathbb{R} \mid x \geq 10\}$

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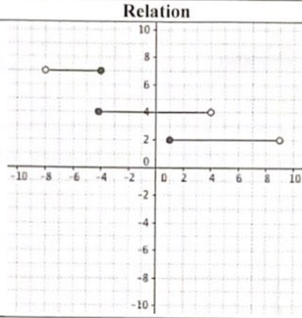
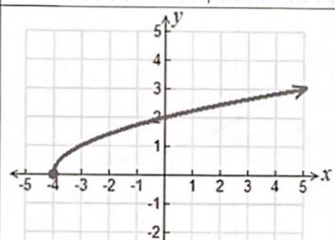
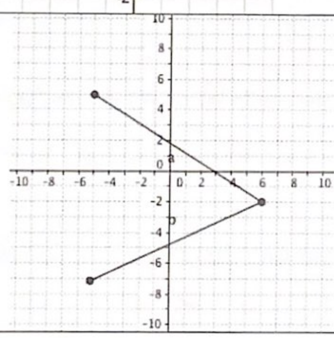
11. Complete the chart by stating the domain and range:

	Relation	Domain	Range
a)		$\{x \in \mathbb{R} \mid -8 < x < 9\}$	$\{y \in \mathbb{R} \mid y = 2 \text{ or } y = 4 \text{ or } y = 7\}$
b)		$\{x \in \mathbb{R} \mid x \geq -4\}$	$\{y \in \mathbb{R} \mid y \geq 0\}$
c)		$\{x \in \mathbb{R} \mid -5 \leq x \leq 6\}$	$\{y \in \mathbb{R} \mid -7 \leq y \leq 5\}$

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12. If $f(x) = 5 - 2x + k$ and $f(f(k)) = 13$, determine the value of k.

$f(f(k)) = 13$

$f(5 - 2k + k) = 13$

$f(5 - k) = 13$

$5 - 2(5 - k) + k = 13$

$5 - 10 + 2k + k = 13$

$-5 + 3k = 13$

$3k = 18$

$k = 6$

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