

Unit 1.

MCR3U Exam Review.

1. a) $y = 5x$ linear function (passes VLT)

b) $y = 2(x-1)^2$ parabola function (passes VLT)

c) $x^2 + y^2 = 4$ circle NOT a function. (fails VLT)

d) function. passes VLT

e) NOT a function
 $x = 2$ repeats.

② $f(x) = 4(x-1)^2 - 11$

a) $f(-2) = 4(-2-1)^2 - 11$
 $= 4(-3)^2 - 11$
 $= 36 - 11$
 $= 25$

b) $f(x) = 53$

$$53 = 4(x-1)^2 - 11$$

$$64 = 4(x-1)^2$$

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

$$x-1 = 4 \quad \text{or} \quad x-1 = -4$$

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

③ $y = -3(x+5)^2$

- reflection around x -axis
- vertically stretched by a factor of 3
- translation 5 units to the left.

$$D: \{x \in \mathbb{R}\}$$

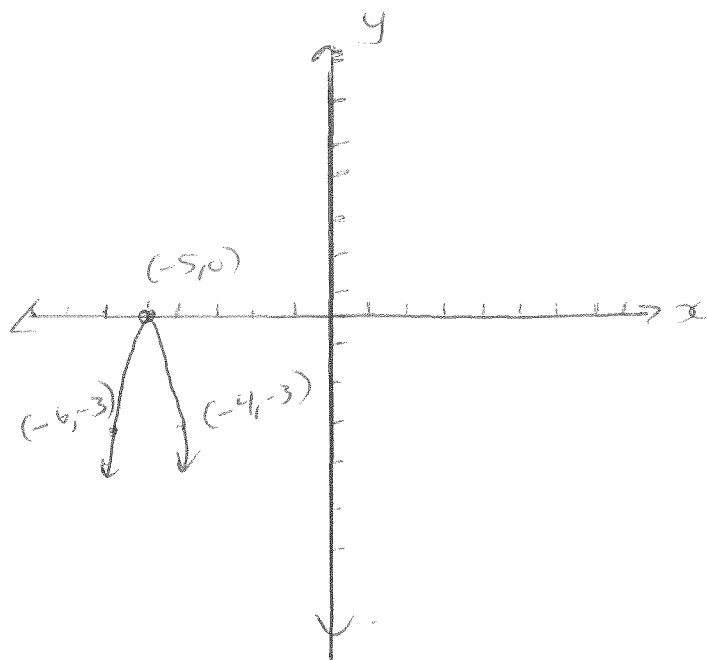
$$R: \{y \in \mathbb{R} \mid y \leq 0\}$$

$$(x, y) \rightarrow (x-5, -3y)$$

$$(0, 0) \rightarrow (-5, 0)$$

$$(1, 1) \rightarrow (-4, -3)$$

$$(-1, 1) \rightarrow (-6, -3)$$



Unit 1

$$3(ii) \quad y = \sqrt{\frac{1}{2}(x-4)} + 3$$

- Reflection around y-axis
- Horizontally stretched by a factor of 2
- translation 4 units to the right and 3 units up.

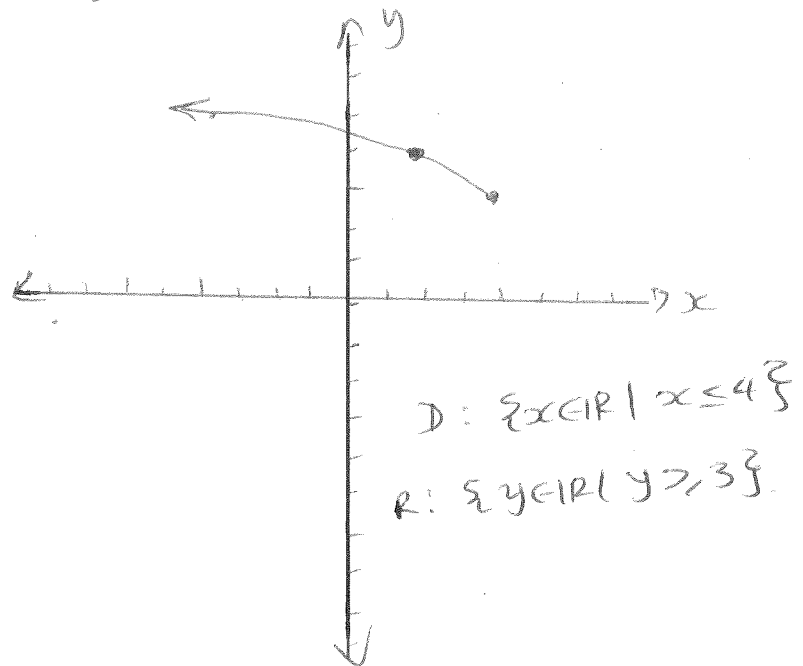
$$(x, y) \rightarrow (-2x+4, y+3)$$

$$(0, 0) \rightarrow (4, 3)$$

$$(1, 0) \rightarrow (2, 4)$$

$$(4, 2) \rightarrow (-4, 5)$$

$$(9, 3) \rightarrow (-14, 6)$$



$$3(iii) \quad y = \frac{1}{x-3} + 5$$

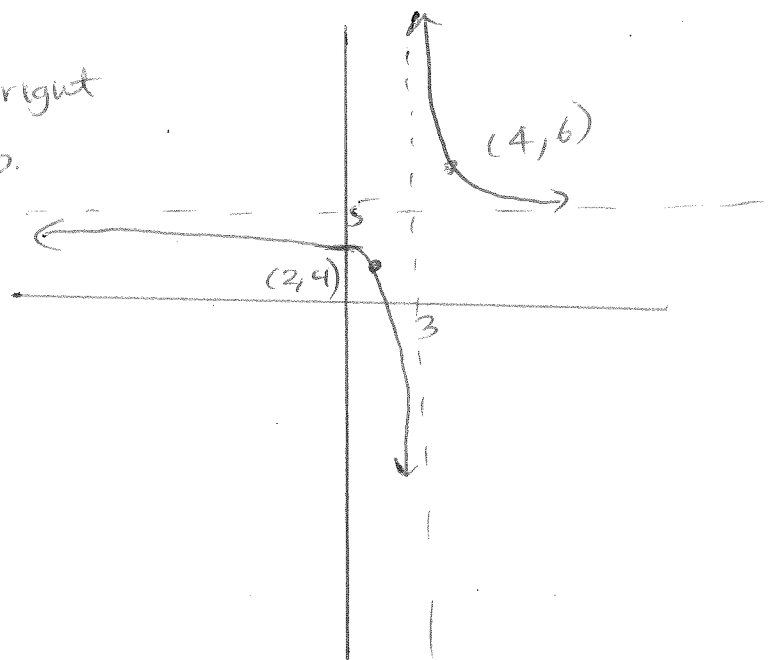
translation: 3 units to the right
and 5 units up.

$$D: \{x \in \mathbb{R} \mid x \neq 3\}$$

$$R: \{y \in \mathbb{R} \mid y \neq 5\}$$

$$HA: y = 5$$

$$VA: x = 3$$



Unit 1

④

$$f(x) = \sqrt{x}$$

$$y = -3f(x) - 1$$

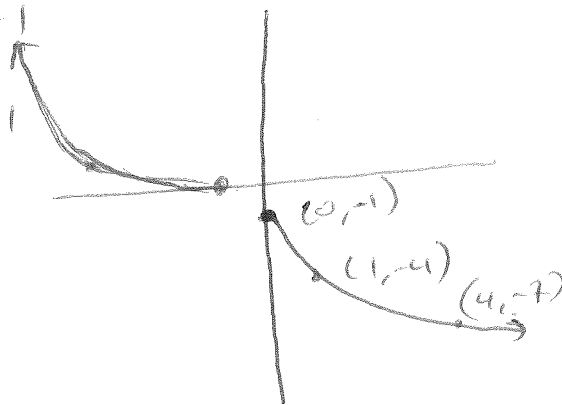
$$= -3\sqrt{x} - 1$$

$$(x, y) \rightarrow (x, -3y - 1)$$

$$(0, 0) \rightarrow (0, -1)$$

$$(1, 1) \rightarrow (1, -4)$$

$$(4, 2) \rightarrow (4, -7)$$



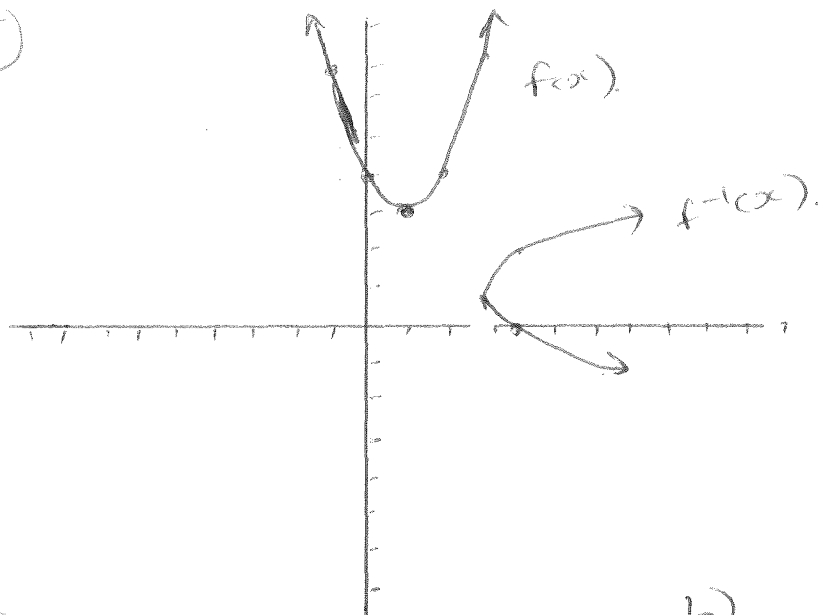
Inverse:

$$(-1, 0)$$

$$(-4, 1)$$

$$(-7, 4)$$

⑤



INVERT THE POINTS

$$(1, 3) \rightarrow (3, 1)$$

$$(0, 4) \rightarrow (4, 0)$$

$$(2, 4) \rightarrow (4, 2)$$

⑥ a) $f(x) = 2(x-3)^2$

$$y = 2(x-3)^2$$

$$x = 2(y-3)^2$$

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

$$\boxed{\pm \sqrt{\frac{x}{2}} + 3 = y}$$

b) $y = -5x + 9$

$$x = -5y + 9$$

$$x - 9 = -5y$$

$$y = \frac{x-9}{-5}$$

$$\boxed{f^{-1}(x) = \frac{x-9}{-5}}$$

7) a) $h(4) = -0.15(4)^2 + 0.6(4) + 1.8 = 1.8 \text{ m}$

b) D: $\{ t \in \mathbb{R} \mid 0 \leq t \leq 6 \}$

R: $\{ h \in \mathbb{R} \mid 0 \leq h \leq 2.4 \}$

Unit 2

$$8) a) 6(x-3) - (2x+5)^2$$

$$= 6x - 18 - [(2x+5)(2x+5)]$$

$$= 6x - 18 - [4x^2 + 20x + 25]$$

$$= 6x - 18 - 4x^2 - 20x - 25$$

$$= -4x^2 - 14x - 43.$$

$$9) a) 2x^2 + 5x - 12$$

$$= 2x^2 + 8x - 3x - 12$$

$$= 2x(x+4) - 3(x+4)$$

$$= (2x-3)(x+4)$$

$$10) a) \frac{3x^2 - 3x}{4x^2 - 4x}$$

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

$$= \frac{3}{4}, x \neq 0, 1$$

$$8) b) (3x-1)(x^2 - 6x + 4)$$

$$= 3x^3 - 18x^2 + 12x - x^2 + 6x - 4$$

$$= 3x^3 - 19x^2 + 18x - 4$$

$$9) b) 12x^2 - 75y^2$$

$$= 3(4x^2 - 25y^2)$$

$$= 3(2x-5y)(2x+5y)$$

$$10) b) \frac{x^2 - 9}{x^2 + x - 12}$$

$$= \frac{(x-3)(x+3)}{(x+4)(x-3)}$$

$$= \frac{x+3}{x+4}, x \neq 3, -4.$$

Unit 2

$$\begin{aligned}
 10c) \quad & \frac{3}{3x^2+5x-2} - \frac{2x}{x^2+x-2} \\
 & = \frac{3(x-1)}{(3x-1)(x+2)(x-1)} - \frac{2x(3x-1)}{(x-1)(x+2)(3x-1)} \\
 & = \frac{3x-3-6x^2+2x}{(3x-1)(x+2)(x-1)} \\
 & = \frac{-6x^2+5x-3}{(3x-1)(x+2)(x-1)} \quad , x \neq -2, \frac{1}{3}, 1
 \end{aligned}$$

$$\begin{aligned}
 10d) \quad & \frac{x^2-16}{x^2+x-20} \times \frac{8x+40}{3x^2+10x-8} \\
 & = \frac{(x-4)(x+4)(8)(x+5)}{(x+5)(x-4)(3x-2)(x+4)} \\
 & = \frac{8}{3x-2}, \quad x \neq \pm 4, 2, -5
 \end{aligned}$$

$$\begin{aligned}
 10e) \quad & \frac{3xy^4}{4x^3y} \times \frac{12x^5y}{15x^4y^2} \\
 & = \frac{36x^6y^5}{60x^7y^3} \\
 & = \frac{3y^2}{5x}, \quad x, y \neq 0
 \end{aligned}$$

$$\begin{aligned}
 11) \quad a) \quad & \sqrt{98} = \sqrt{49 \cdot 2} \\
 & = 7\sqrt{2}
 \end{aligned}$$

$$\begin{aligned}
 b) \quad & \sqrt{27} - 2\sqrt{75} + 3\sqrt{108} \\
 & = \sqrt{9}\sqrt{3} - 2\sqrt{25}\sqrt{3} + 3\sqrt{36}\sqrt{3} \\
 & = 3\sqrt{3} - 10\sqrt{3} + 18\sqrt{3} \\
 & = 11\sqrt{3}
 \end{aligned}$$

$$\begin{aligned}
 c) \quad & (4-\sqrt{6})(5+\sqrt{8}) \\
 & = 20 + 4\sqrt{8} - 5\sqrt{6} - \sqrt{48} \\
 & = 20 + 4\sqrt{4}\sqrt{2} - 5\sqrt{6} - \sqrt{16}\sqrt{3} \\
 & = 20 + 8\sqrt{2} - 5\sqrt{6} - 4\sqrt{3}
 \end{aligned}$$