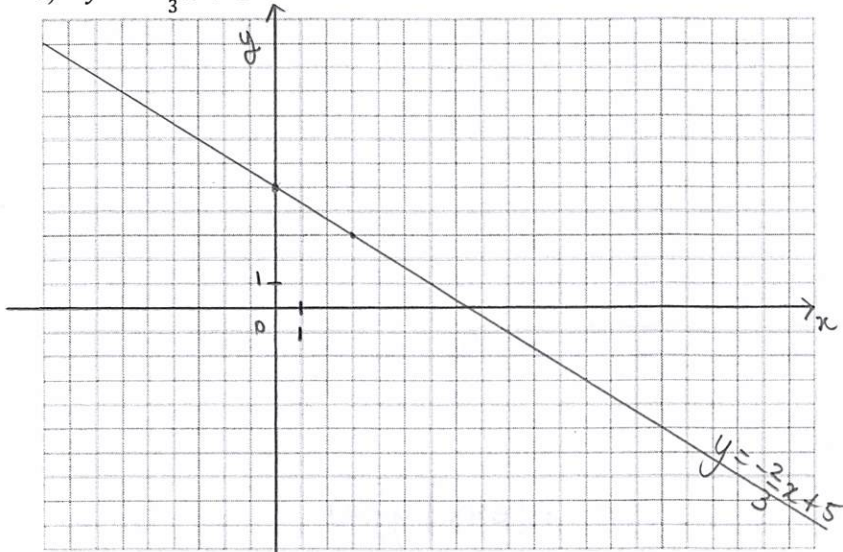


Introduction TEST

1. Graph the following functions. Determine their domains, Ranges, exact values of the intercepts and vertex when relevant.

a) $y = -\frac{2}{3}x + 5$



$x\text{-int: } 0 = -\frac{2}{3}x + 5$
 $\frac{2}{3}x = 5$
 $x = \frac{15}{2}$

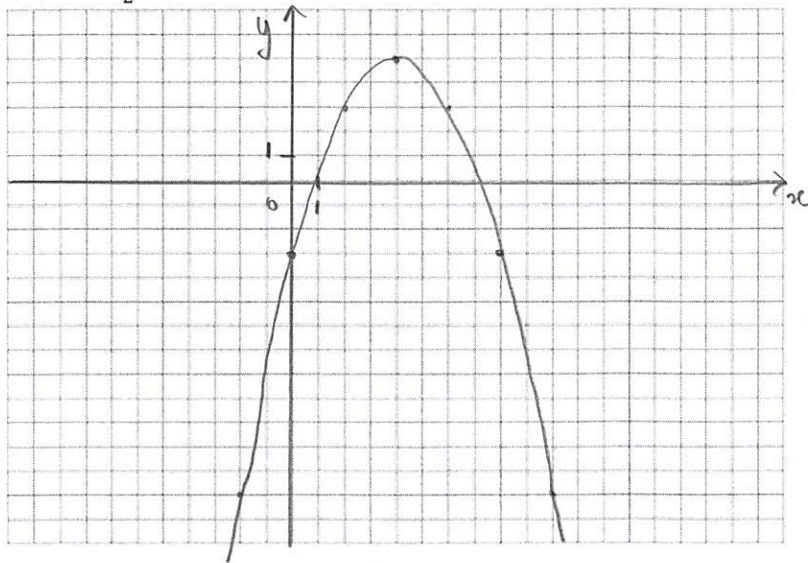
Domain: \mathbb{R}

Range: \mathbb{R}

x-intercepts: $\frac{15}{2}$

y-intercept: 5

b) $y = -\frac{1}{2}x^2 + 4x - 3$



$\frac{-b}{2a} = \frac{-4}{-1} = 4$
 if $x = 4$, $y = -\frac{1}{2} \times 16 + 16 - 3 = 5$

$\Delta = 16 - 4 \times (-\frac{1}{2}) \times (-3) = 10$

Domain: \mathbb{R}

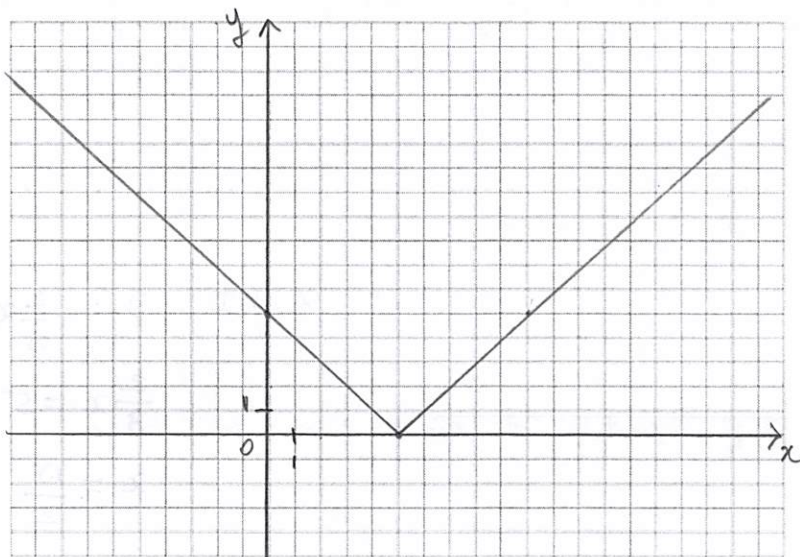
Range: $\{y \in \mathbb{R} \mid y \leq 5\}$

x-intercepts: $\frac{-4 \pm \sqrt{10}}{-1} = 4 \pm \sqrt{10}$

y-intercept: -3

Vertex: (4, 5)

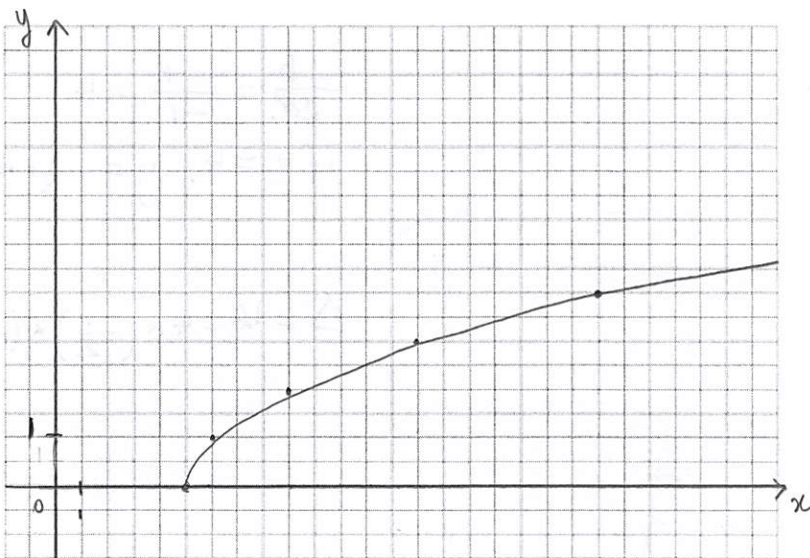
c) $y = |5 - x|$

Domain: \mathbb{R} Range: $\{y \in \mathbb{R} \mid y \geq 0\}$

x-intercepts: 5

y-intercept: 5

e) $y = \sqrt{x - 5}$

Domain: $\{x \in \mathbb{R} \mid x \geq 5\}$ Range: $\{y \in \mathbb{R} \mid y \geq 0\}$

x-intercepts: 5

y-intercept: \emptyset

2. Solve the following equations algebraically. Keep exact values.

a) $3(x - 5) = 2x + 1$

$$3x - 15 = 2x + 1$$

$$\boxed{x = 16}$$

b) $\frac{x+4}{2} = \frac{2x-5}{3}$

$$3(x+4) = 2(2x-5)$$

$$3x + 12 = 4x - 10$$

$$\boxed{22 = x}$$

c) $x^2 - x - 6 = 0$ by factoring

$$(x-3)(x+2) = 0$$

$$\boxed{x = 3}$$

$$\boxed{x = -2}$$

d) $x^2 - 5x = 7$

$$x^2 - 5x - 7 = 0$$

$$\Delta = 25 - 4(-7) = 53$$

$$\boxed{x = \frac{5 \pm \sqrt{53}}{2}}$$

e) $|x + 5| = 4x - 1$

$$\bullet x + 5 = 4x - 1$$

$$6 = 3x$$

$$\boxed{x = 2}$$

$$\bullet -x - 5 = 4x - 1$$

$$-4 = 5x$$

$$x = -4/5$$

$$\begin{array}{l|l} |x+5| = 4x-1 & \\ \hline 21/5 & -21/5 \\ & x \end{array}$$

f) $x - \sqrt{2x+3} = 6$

• restrictions: $2x+3 \geq 0$ i.e. $x \geq -3/2$

• resolution: $\sqrt{2x+3} = x - 6$

$$2x+3 = x^2 - 12x + 36$$

$$x^2 - 14x + 33 = 0$$

$$(x-3)(x-11) = 0$$

$$x = 3 \quad \boxed{x = 11}$$

• tests: $x - \sqrt{2x+3} = 6$

$$\begin{array}{l|l} 3 - \sqrt{6+3} & 6 \\ \hline 0 & x \end{array}$$

$$\begin{array}{l|l} 11 - \sqrt{25} & 6 \\ \hline 6 & \checkmark \end{array}$$

3. a) Rewrite in vertex form

$$A = -x^2 + 6x - 5$$

$$\frac{-b}{2a} = 3 \Rightarrow \text{vertex } (3, 4)$$

$$\boxed{A = -(x-3)^2 + 4}$$

b) Rewrite in factored form.

$$B = 2x^2 + 5x - 3$$

$$= \boxed{(2x-1)(x+3)}$$

$$C = 5x^2 - 20$$

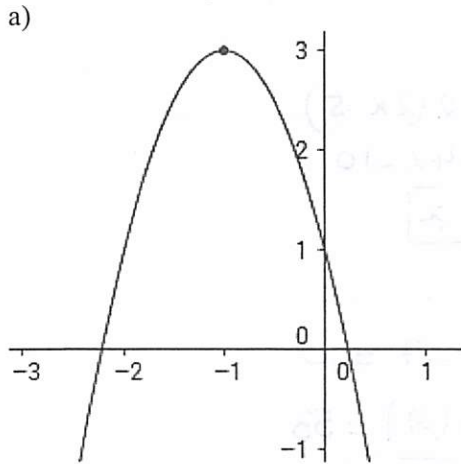
$$= \boxed{5(x+2)(x-2)}$$

c) Rewrite in general form.

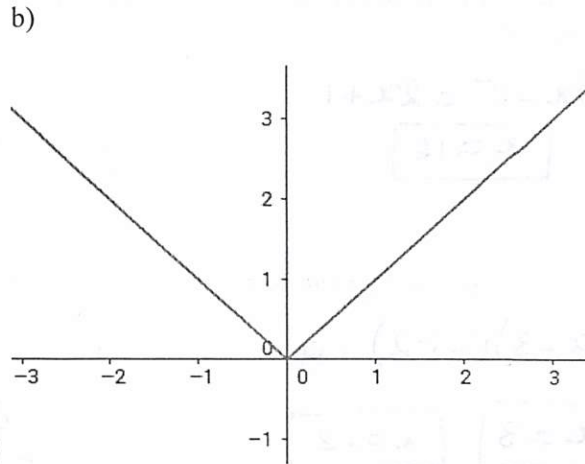
$$D = -2(x-1)^2 + 6$$

$$= \boxed{-2x^2 + 4x + 4}$$

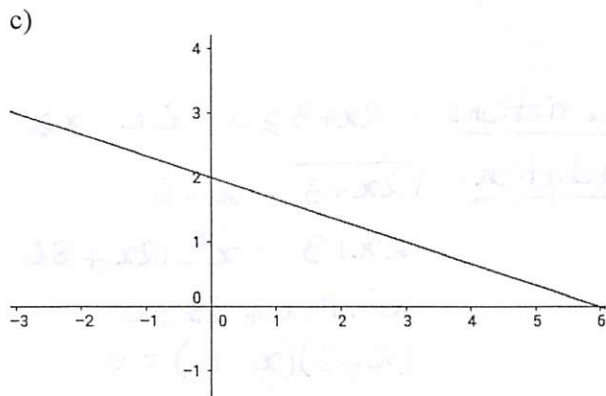
4. Determine the equations of the following graphs.



$y = -2(x+1)^2 + 3$



$y = |x|$



$y = -\frac{1}{3}x + 2$

5. a) Let $f(x) = 2x + 5$ and $g(x) = x^2$. Determine the expressions of the following composite functions:

$f \circ g(x) = 2x^2 + 5$

$g \circ f(x) = (2x+5)^2$

$f(-x) = -2x + 5$

$g(-x) = (-x)^2 = x^2$

b) Express the following functions as compositions of usual functions:

$f(x) = 3\sqrt{x} + 2$

let $g(x) = \sqrt{x}$

$h(x) = 3x + 2$

$f(x) = h \circ g(x)$

$g(x) = (-2x + 3)^3$

let $f(x) = -2x + 3$

$h(x) = x^3$

$g(x) = h \circ f(x)$