

Name: Solutions**Marking Summary:**

Knowledge/Understanding: questions #1, 2, 4, 5, 6, 10

Application: questions #3, 7, 8, 9, 11, 12, 13

Thinking/Inquiry and Problem Solving: #12

Communication: all

Total Marks: 80

1. Expand and simplify each of the following. [10 marks]

a)  $3x(2x + 4)$

$$= 6x^2 + 12x \quad \checkmark$$

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

$$= 2x^2 + 8x - 3x - 12 \quad \checkmark$$
$$= 2x^2 + 5x - 12$$

c)  $-3(2x-1)^2$

$$= -3(2x-1)(2x-1)$$
$$= -3(4x^2 - 4x + 1) \quad \checkmark$$
$$= -12x^2 + 12x - 3$$

d)  $2x(x-1) - (x-1)(2x+1)$

$$= 2x^2 - 2x - (2x^2 - x + 1)$$
$$= 2x^2 - 2x - 2x^2 + x - 1 \quad \checkmark$$
$$= -x - 1$$

2. Solve each of the following. [12 marks]

a)  $3(4x - 1) = 10x + 9$

$$12x - 3 = 10x + 9$$

$$2x = 12$$

$$x = 6$$

b)  $x^2 - 9 = 40$

$$x^2 = 49$$

$$x = \pm 7$$

c)  $\frac{3n-1}{2} + \frac{1}{3} = 2n$

$$\frac{3(3n-1)}{6} + \frac{2}{6} = \frac{12n}{6}$$

$$9n - 3 + 2 = 12n$$

$$-3n = 1$$

$$n = -\frac{1}{3}$$

d)  $\frac{y+3}{4} = \frac{y}{7}$

$$7(y+3) = 4y$$

$$3y = -21$$

$$y = -7$$

3. Create a table of values and graph  $y = x^2 + 2x - 1$ .

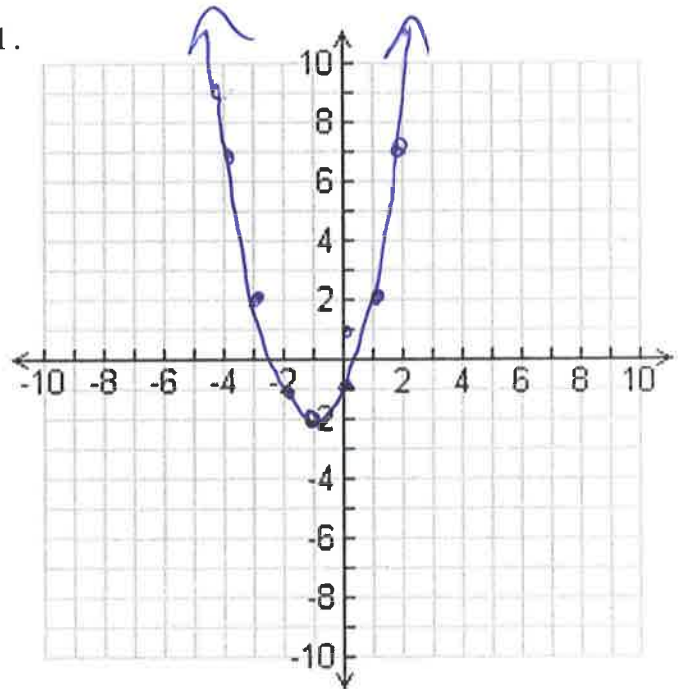
x	y
-4	7
-3	2
-2	-1
-1	-2
0	-1
1	2
2	7

$$y = 16 - 8 - 1$$

$$9 - 6 - 1$$

$$4 - 4$$

$$1 - 2 - 1$$



Where is the vertex of this graph?

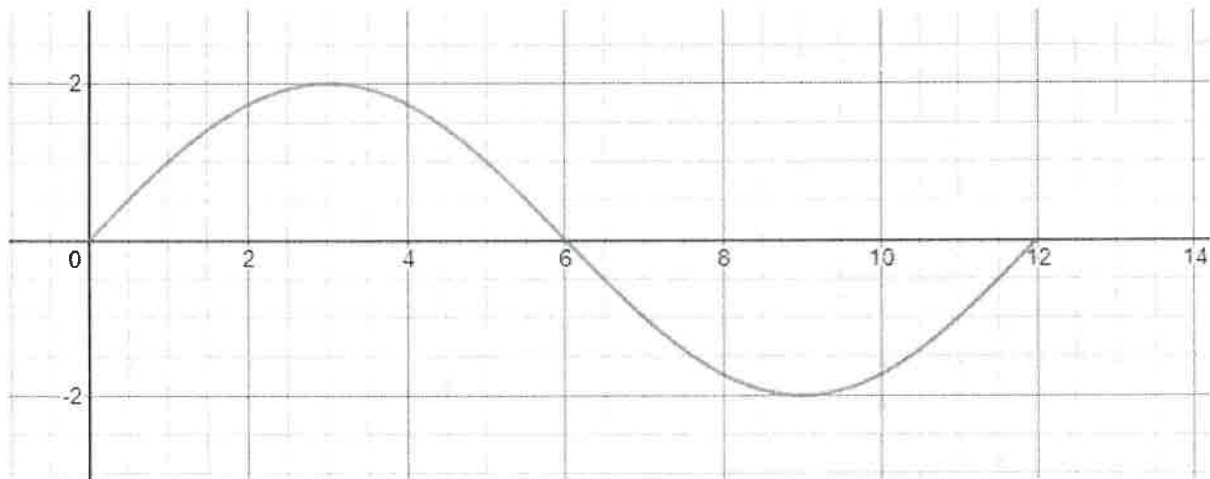
$$(-1, -2)$$

Where is the y-intercept?

$$(0, -1)$$

[6 marks]

4. Examine the relationship below.



[3 marks]

a) Is this relationship a function? (yes or no)

yes

b) What is the domain of this relationship?

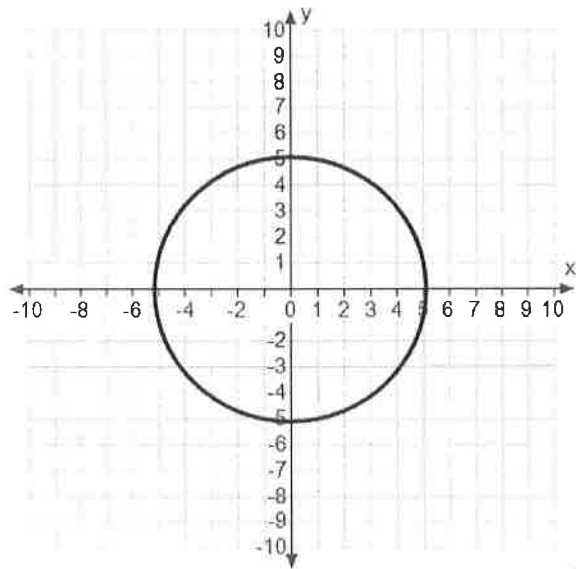
$$D = \{x \in \mathbb{R} \mid 0 \leq x \leq 12\}$$

c) What is the range of this relationship?

$$R = \{y \in \mathbb{R} \mid -2 \leq y \leq 2\}$$

5. A relationship (circle) is shown on the graph below.

[3 marks]



a) Is this relationship a function? (yes or no) **NO**

b) What is the domain of this relationship?  **$D = \{x \in \mathbb{R} \mid -5 \leq x \leq 5\}$**

c) What is the range of this relationship?  **$\{y \in \mathbb{R} \mid -5 \leq y \leq 5\}$**

6. Let  $f(x) = 3x - 1$  and  $g(x) = 3x^2 - x + 1$ . [10 marks]

a) Evaluate  $f(2)$ .

$$\begin{aligned} f(2) &= 3(2) - 1 \\ &= 5 \end{aligned}$$

b) Evaluate  $g(3)$ .

$$\begin{aligned} g(3) &= 3(3)^2 - 3 + 1 \\ &= 3(9) - 3 + 1 \\ &= 25 \end{aligned}$$

c) Evaluate  $g(-2)$

$$\begin{aligned} g(-2) &= 3(-2)^2 - (-2) + 1 \\ &= 3(4) + 2 + 1 \\ &= 15 \end{aligned}$$

d) When does  $f(x) = 2$ ?

$$\begin{aligned} 2 &= 3x - 1 \\ 3 &= 3x \\ x &= 1 \end{aligned}$$

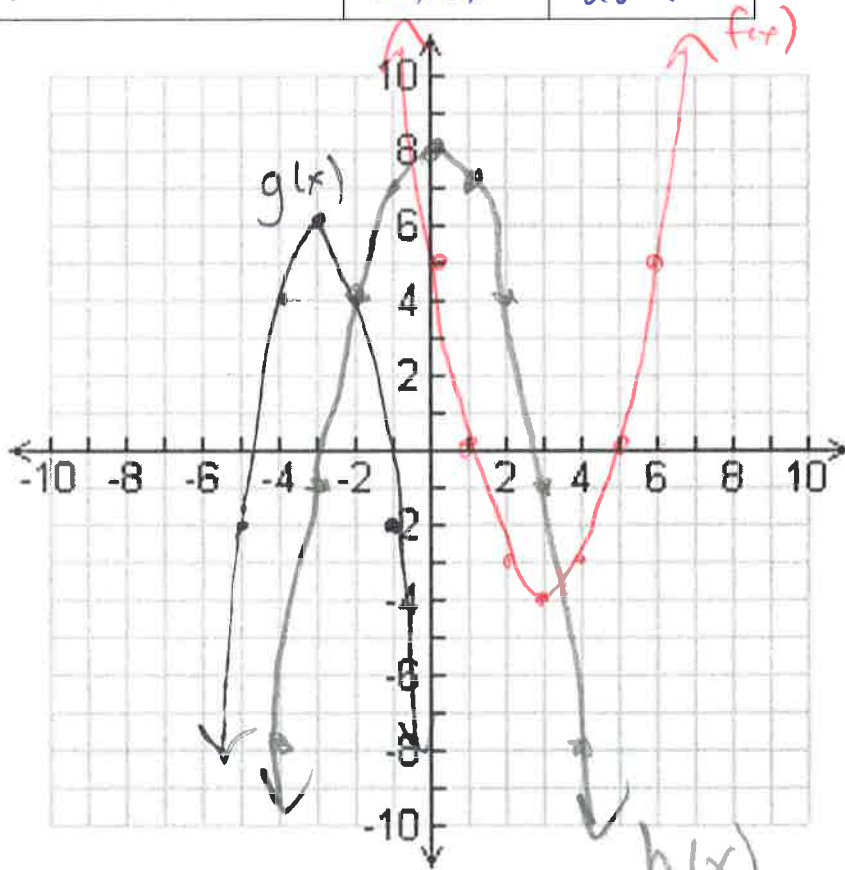
e) Evaluate  $g\left(\frac{2}{3}\right)$ .

$$\begin{aligned} g\left(\frac{2}{3}\right) &= 3\left(\frac{2}{3}\right)^2 - \frac{2}{3} + 1 \\ &= 3\left(\frac{4}{9}\right) - \frac{2}{3} + 1 \\ &= \frac{12}{9} - \frac{2}{3} + 1 \\ &= \frac{4}{3} - \frac{2}{3} + \frac{3}{3} \\ &= \frac{5}{3} \end{aligned}$$

7. Complete the table below and graph each parabola in the graph provided. (Label each graph).

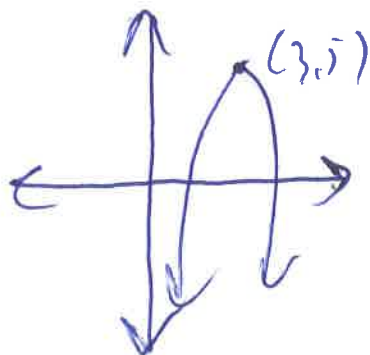
Equation	Vertex	Direction of Opening
$f(x) = (x - 3)^2 - 4$	$(3, -4)$	up
$g(x) = -2(x + 3)^2 + 6$	$(-3, 6)$	down
$h(x) = -x^2 + 8$	$(0, 8)$	down

$(1, 3, 5, \dots)$   
 $2, 6, 10, \dots$



[9 marks]

8. What is the domain and range of the function  $f(x) = -2(x - 3)^2 + 5$ ? Draw a very rough sketch of this graph. [3 marks]



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

$R = \{f(x) \in \mathbb{R} \mid f(x) \leq 5\}$

9. Suppose that a new parabola is created by taking the graph of  $y = x^2$  and:

[3 marks]

- reflecting it in the x-axis
- vertically stretching (expanding) it by a factor of 4.
- shifted it 3 units to the right and 1 unit up.

What is the equation of this new parabola?

$$y = -4(x-3)^2 + 1$$

10. Classify each function below as: linear, quadratic or neither. Justify your answer. [6 marks]

X	y
0	1
1	2
2	5
3	10
4	17

quadratic

x	y
0	2
1	6
2	18
3	54
4	162
5	486

neither

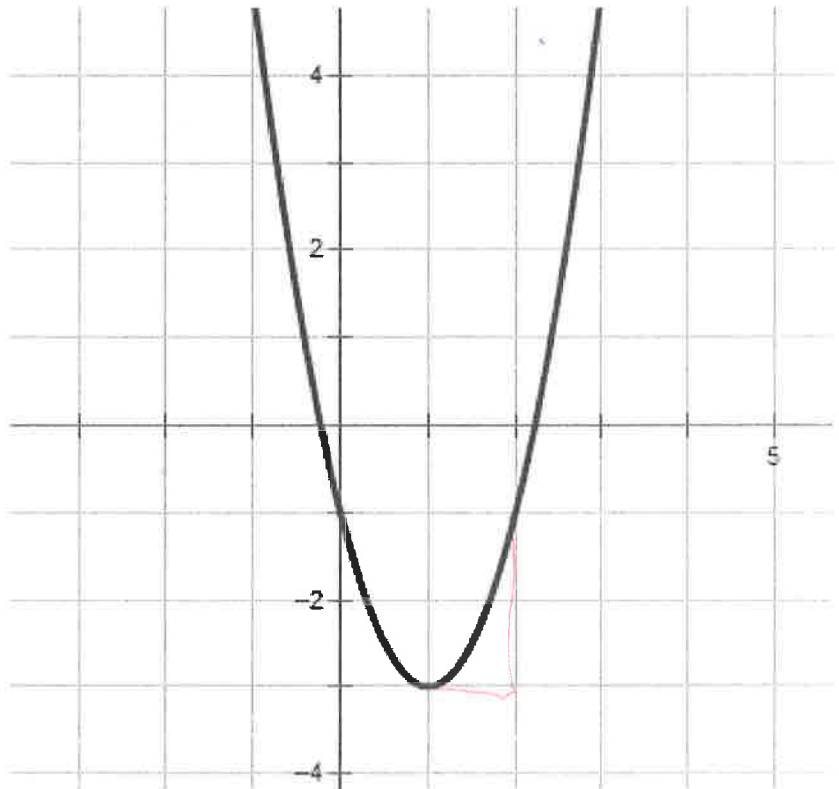
x	y
0	6
1	21
2	36
3	51
4	66
5	81

linear

11. Find the equation for the parabola shown below.

[4 marks]

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



12. Find the equation of the quadratic function pictured below. [5 marks]

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

sub in (8, -5)

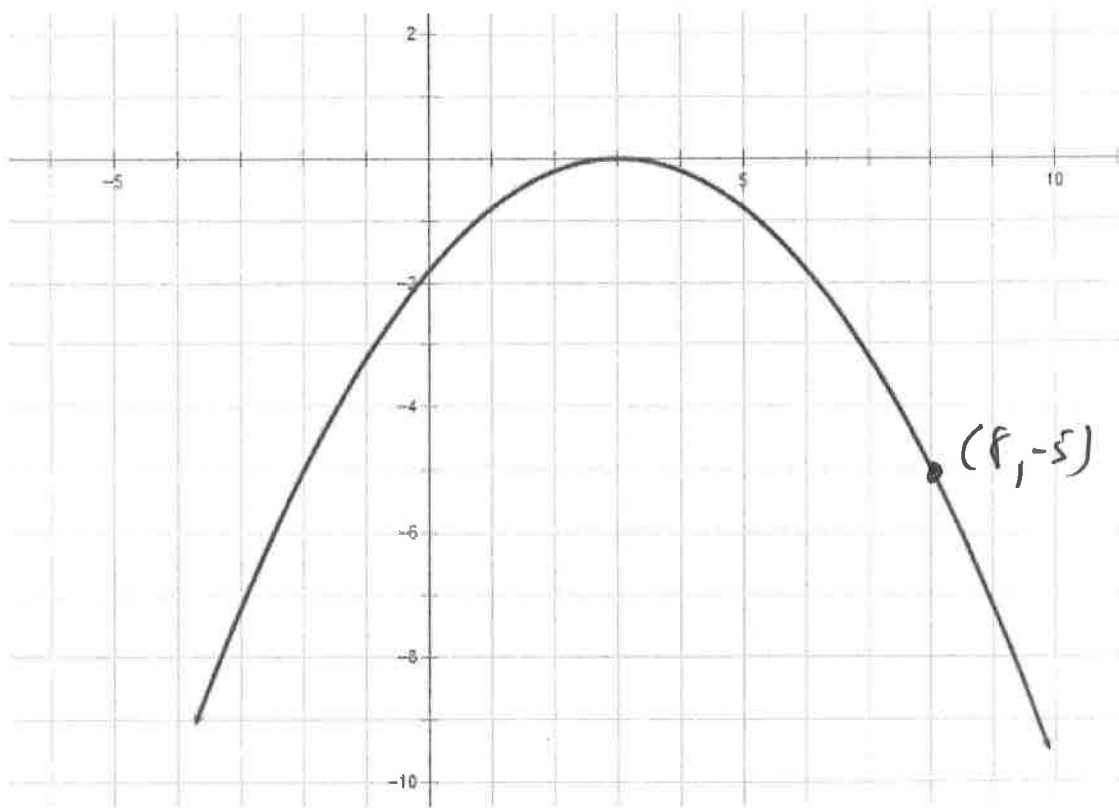
$$-5 = a(8-3)^2$$

$$-5 = a(5)^2$$

$$-5 = 25a$$

$$a = -\frac{1}{5}$$

$$y = -\frac{1}{5}(x-3)^2$$



13. The height, in metres, of a ball  $t$  seconds after being thrown is modeled by the function  $h(t) = -4.9(t-2)^2 + 45$ . [6 marks]

a) Find the initial (starting) height of the ball.

$$h(0) = -4.9(-2)^2 + 45$$

$$h(0) = 25.4 \text{ m} \quad \text{what? (sorry)}$$

b) What is the maximum height of the ball? When does this occur?

45 m after 2 seconds.

c) Find  $h(3)$ . What does this tell you about the ball?

$$h(3) = -4.9(3-2)^2 + 45$$

$$h(3) = 40.1 \text{ m}$$

height of ball after  
3 seconds!