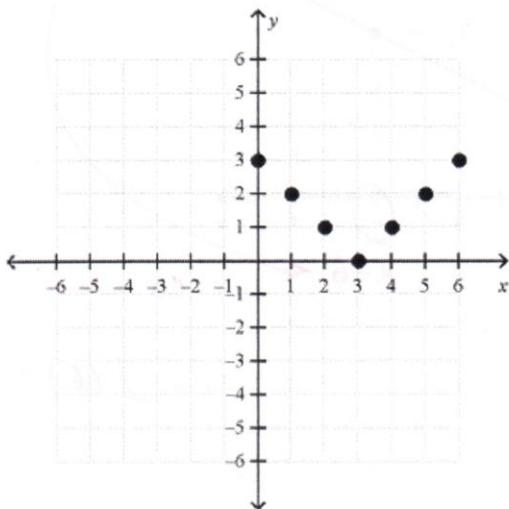


Assignment 1

1. What are the domain and range of the function? [C: 2 marks]



Domain

$$\{x \in \mathbb{I}, 0 \leq x \leq 6\}$$

Range

$$\{y \in \mathbb{I}, 0 \leq y \leq 25\}$$

2. Explain how the vertical line test can be used to determine if a relation is a function. [C: 1 mark]

A relation is a function if all possible x-values have only 1-y-value.

A vertical line should be able to travel across a function's graph and only intersect the graph once.

3. The table shows some values for the function $f(x)$. [K: 1 mark]

x	-3	0	3	6	9
$f(x)$	0	-9	0	27	72

Evaluate $f(0)$.

$f(0)$ is where $x=0$. Thus $f(0) = -9$

4. Evaluate, given $f(x) = x^2 - 10x + 25$. ~~[K: 2 marks]~~

1 for plugging K in correctly
1 for correct answer

a) $f(3)$ [K: 2 marks]

$$\begin{aligned} f(3) &= (3)^2 - 10(3) + 25 \\ &= 9 - 30 + 25 \\ &= 4 \end{aligned}$$

b) $f(-2)$ [K: 2 marks]

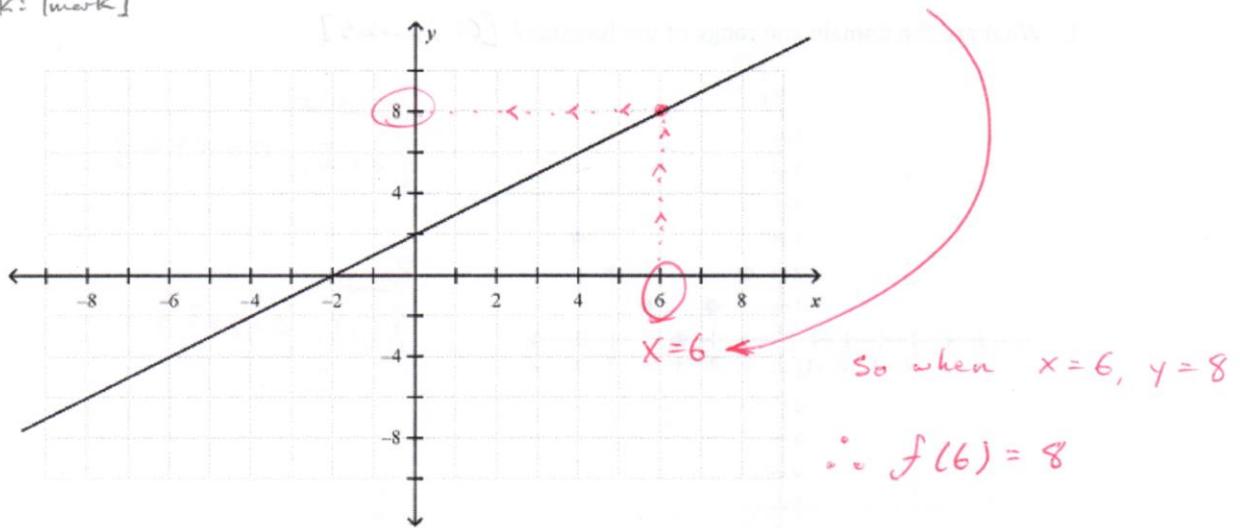
$$\begin{aligned} f(-2) &= (-2)^2 - 10(-2) + 25 \\ &= 4 + 20 + 25 \\ &= 49 \end{aligned}$$

c) $f(\frac{1}{4})$ [K: 2 marks]

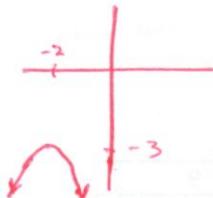
$$\begin{aligned} f\left(\frac{1}{4}\right) &= \left(\frac{1}{4}\right)^2 - 10\left(\frac{1}{4}\right) + 25 \\ &= \frac{1}{16} - \frac{10}{4} + 25 \\ &= \frac{1}{16} - \frac{40}{16} + \frac{400}{16} \\ &= \frac{361}{16} \end{aligned}$$

5. The graph of $y = f(x)$ is shown below. Evaluate $f(6)$.

[K: 1 mark]



6. A parabola opens down and its vertex is located at $(-2, -3)$. Write the domain and range as a set (no mark will be given if answers are written in the incorrect notation). [C: 2 marks]



Domain

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

Range

$$\{y \in \mathbb{R}, y \leq -3\}$$

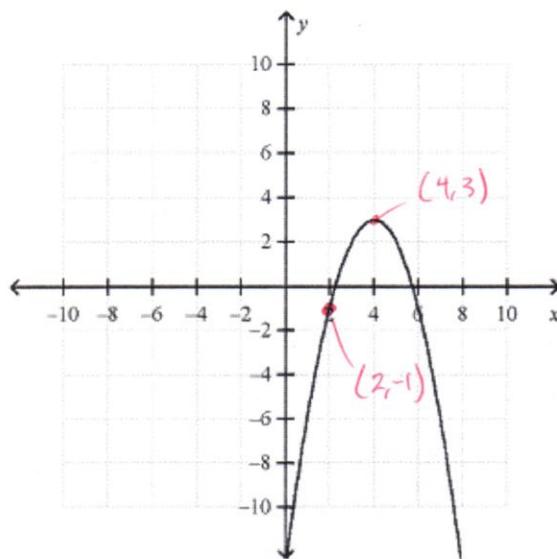
7. Identify whether the set of data is linear or quadratic. Calculate the first differences, and second differences, if necessary. [K: 3 marks]

x	y	1 st
-3	0	
-2	-4	$-4 - 0 = -4$
-1	-6	$-6 - (-4) = -2$
0	-6	$-6 - (-6) = 0$
1	-4	$-4 - (-6) = 2$
2	0	$0 - (-4) = 4$
3	6	$6 - 0 = 6$

x	y	2 nd
-3	0	
-2	-4	$-2 - (-4) = +2$
-1	-6	$0 - (-2) = +2$
0	-6	$2 - 0 = +2$
1	-4	$4 - 2 = +2$
2	0	$6 - 4 = +2$

Because the second differences are constant, the set of data is quadratic.

8. The function $g(x)$ is congruent to $f(x) = x^2$. Describe the transformations applied to the graph of $f(x) = x^2$ to obtain the graph of $g(x)$. [C: 3 marks] 1 for each description



• Vertex at $(4, 3)$

means graph shifted 4 units right
and shifted 3 units up
which means $y = a(x-4)^2 + 3$

• Choose a point on the graph so
that you get an x and y -value to
plug into the above equation

I chose $(2, -1)$ so $x=2, y=-1$
Solve for a ...

$$-1 = a(2-4)^2 + 3$$

$$-1 = a(-2)^2 + 3$$

$$-1 = 4a + 3 \quad a = -1$$

means the graph is reflected about the x -axis.

9. Andrea threw a ball down to the ground from her balcony. The height of the ball is modelled by the function [C: 2 marks] 1 for Domain
1 for Range

$$h(t) = -5t^2 - 10t + 16$$

where t is time in seconds. What are the domain and range of the function?

$$\{t \in \mathbb{R}, 0 \leq t \leq 1.49\}$$

You can find the max t -value by evaluating when $h(t) = 0$

i.e.) $\bullet = -5t^2 - 10t + 16$
quadratic formula needs to be used...

$$t = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(-5)(16)}}{2(-5)}$$

when calculating this you should get
 $t = 1.49$

$$\{h \in \mathbb{R}, 0 \leq h \leq 16\}$$

You can see that 16 is the max height because any positive t you put into the equation always gives you a lower number than 16.

10. For each function, describe the graph in terms of transformations on the graph of $y = x^2$. Then sketch the graph. (Remember to label the vertex, axis of symmetry, and two other points).

(You will most likely need to do this on another sheet of paper)

a) $f(x) = -x^2 + 9$

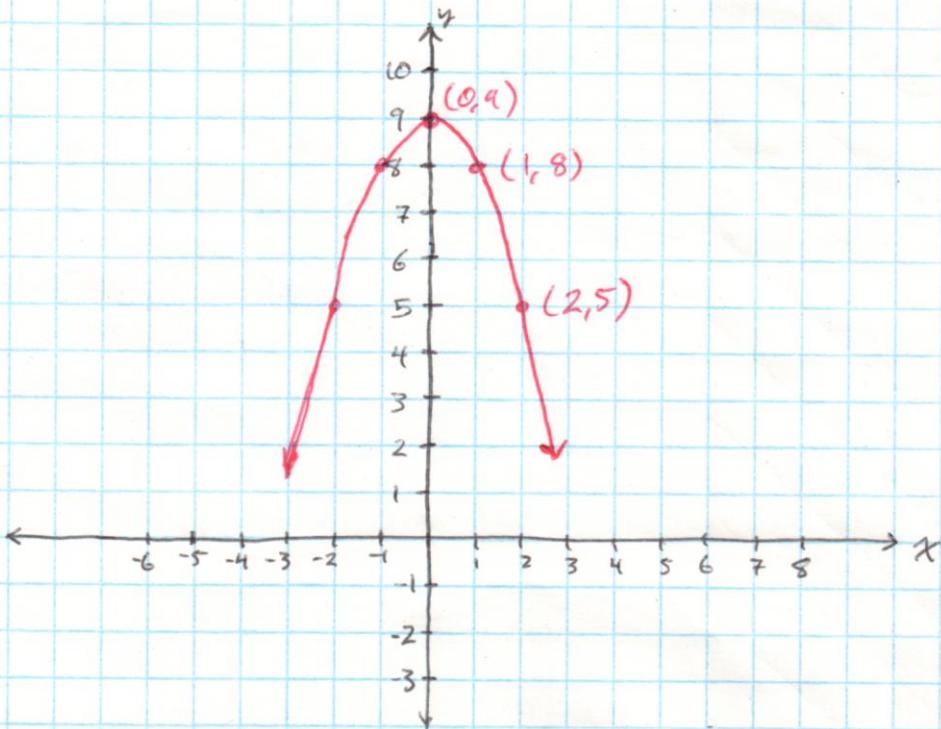
b) $g(x) = 2(x - 4)^2 - 3$

c) $h(x) = -\frac{1}{2}(x + 1)^2 + \frac{1}{2}$

$$10a) f(x) = -x^2 + 9$$

$a = -1$ so... the graph is reflected about the x -axis.

$c = 9$ so... the graph shifts up 9 units.



So the vertex is at $(0, 9)$

x	$y = x^2$	$\alpha = -1$ so $y = x - 1$	$c = 9$ so $y = x^2 + 9$
-2	4	(-2, -4)	(-2, 5)
-1	1	(-1, -1)	(-1, 8)
0	0	(0, 0)	(0, 9)
1	1	(1, -1)	(1, 8)
2	4	(2, -4)	(2, 5)

[2 marks] for description
[3 marks] for graph

$$b) g(x) = 2(x-4)^2 - 3$$

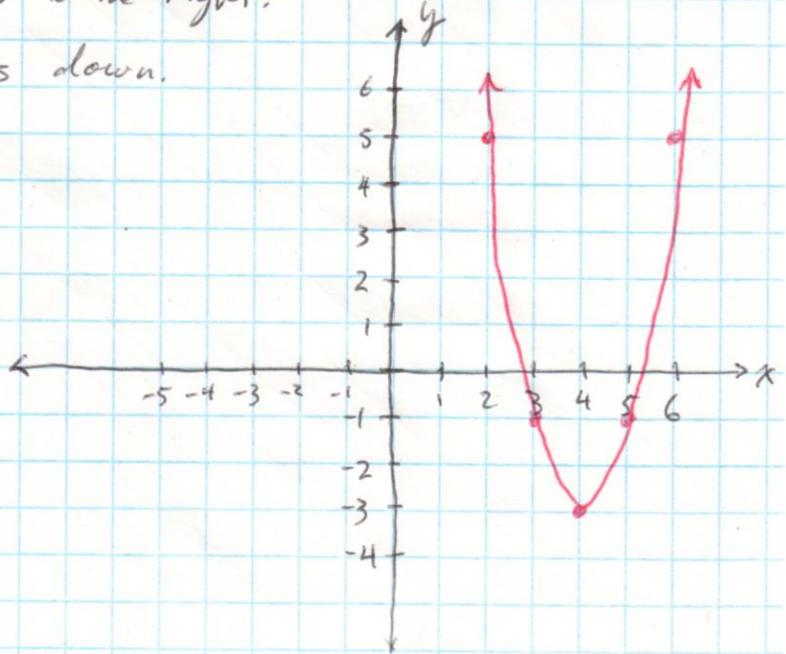
[3 marks] for Description
[3 marks] for graph

$a = 2$ graph is vertically stretched by a factor of 2.

$h = 4$ graph shifts 4 units to the right.

$c = -3$ graph shifts 3 units down.

x	$y = x^2$	$\alpha = 2$ so $y = 2x^2$	$h = 4$ so $y = 2(x-4)^2$	$c = -3$ so $y = 2(x-4)^2 - 3$
-2	4	(-2, 8)	(2, 8)	(2, 5)
-1	1	(-1, 2)	(3, 2)	(3, -1)
0	0	(0, 0)	(4, 0)	(4, -3)
1	1	(1, 2)	(5, 2)	(5, -1)
2	4	(2, 8)	(6, 8)	(6, 5)



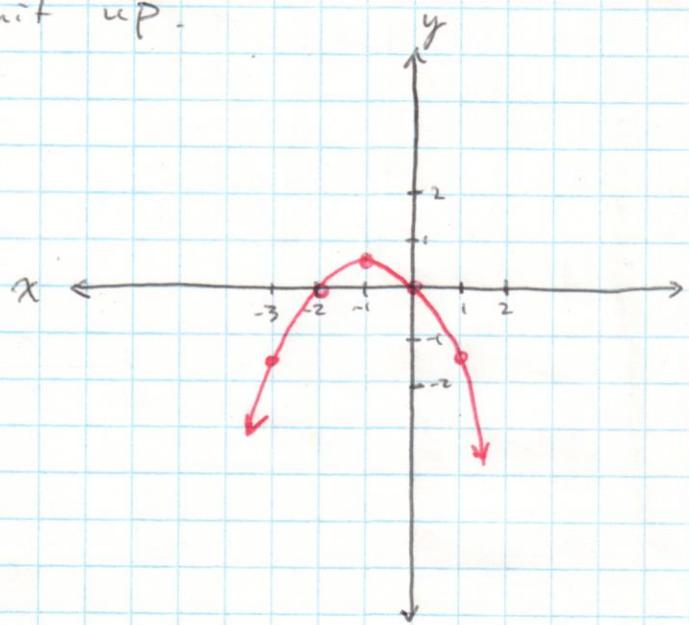
$$c) h(x) = -\frac{1}{2}(x+1)^2 + \frac{1}{2}$$

$a = -\frac{1}{2}$ graph is reflected about the x -axis (because a is negative)
 $k = \frac{1}{2}$ graph is vertically compressed by a factor of $\frac{1}{2}$.

$h = -1$ graph shifts 1 unit left

$k = \frac{1}{2}$ graph shifts $\frac{1}{2}$ unit up.

x	$y = x^2$	$a = -\frac{1}{2}$	$h = -1$	$c = \frac{1}{2}$
		$y \times (-\frac{1}{2})$	$(x+1)$	$(y + \frac{1}{2})$
-2	4	(-2, -2)	(-3, -2)	(-3, - $\frac{3}{2}$)
-1	1	(-1, - $\frac{1}{2}$)	(-2, - $\frac{1}{2}$)	(-2, 0)
0	0	(0, 0)	(-1, 0)	(-1, $\frac{1}{2}$)
1	1	(1, - $\frac{1}{2}$)	(0, - $\frac{1}{2}$)	(0, 0)
2	4	(2, -2)	(1, -2)	(1, - $\frac{3}{2}$)



[4 marks] for Descriptions (1 for each transformation)

[3 marks] for graph (points plotted, accuracy, chart, axes labelled, etc)