1) For each quadratic that is in standard form, determine the value of 'c' that makes each expression a perfect square trinomial (remember, the 'c' value is half of the 'b' value squared)

a) $x^2 + 6x + c$ **b)** $x^2 - 12x + c$ **c)** $x^2 + 2x + c$

2) Rewrite each relation in the form $y = a(x - h)^2 + k$ by completing the square

a) $y = x^2 + 6x - 1$ **b)** $y = x^2 + 10x + 20$

c) $y = x^2 - 6x - 4$ **d)** $y = x^2 - 12x + 8$

e) $y = -x^2 + 80x - 100$

f) $y = 3x^2 + 90x + 50$

g) $y = -7x^2 + 14x - 3$

h) $y = 4x^2 + 64x + 156$

3) Find the maximum or minimum point of each parabola by completing the square.

a) $y = -x^2 - 10x - 9$

b) $y = 2x^2 + 120x + 75$

c) $y = -5x^2 - 200x - 120$

4) The path of a ball is modeled by the equation $y = -x^2 + 4x + 1$, where x is the horizontal distance, in meters, travelled and y is the height, in meters, of the ball above the ground. What is the maximum height of the ball, and at what horizontal distance does it occur?

5) The path of a rocket is given by the equation, $h = -3t^2 + 30t + 73$, where 'h' is the height in meters and 't' is the time in seconds.

**a)** What is the max height of the rocket

b) At what time does the rocket reach its maximum height

6) For each of the following functions, **i)** convert to vertex form by completing the square, **ii)** complete the table of properties, **iii)** graph the function by making a table of values

a) $y = 2x^2 - 12x + 22$

Vertex	
Axis of Symmetry	
Direction of Opening	
Values x may take (domain)	
Values y may take (range)	

x	y
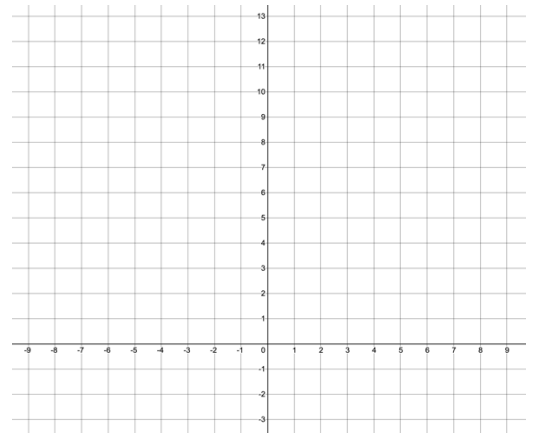
b) $y = \frac{1}{2}x^2 - 4x - 7$

Vertex	
Axis of Symmetry	
Direction of Opening	
Values x may take (domain)	
Values y may take (range)	

x	y
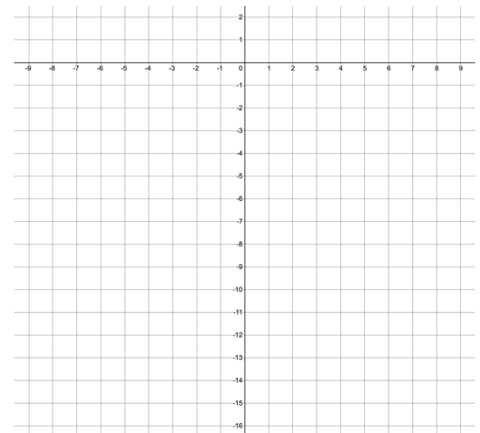
Answers

1)a) 9 **b)** 36 **c)** 1

2)a) $y = (x+3)^2 - 10$ **b)** $y = (x+5)^2 - 5$ **c)** $y = (x-3)^2 - 13$ **d)** $y = (x-6)^2$
e) $y = -(x-40)^2 + 1500$ **f)** $y = 3(x+15)^2 - 625$ **g)** $y = -7(x-1)^2 + 4$ **h)** $y = 4(x+8)^2 - 100$

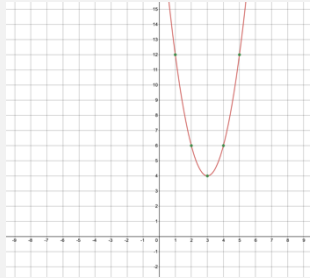**3)a)** max at $(-5,15)$ **b)** min at $(-30, -1725)$ **c)** max at $(-20, 1880)$

4) max height of 5m occurs at a horizontal distance of 2m

5)a) 148m **b)** 5 seconds

6)a)

Vertex	(3,4)
Axis of Symmetry	$x = 3$
Direction of Opening	Up
Values x may take (domain)	$\{X \in \mathbb{R}\}$
Values y may take (range)	$\{Y \in \mathbb{R} \mid y \geq 4\}$

x	y
1	12
2	6
3	4
4	6
5	12

b)

Vertex	$(4, -15)$
Axis of Symmetry	$x = 4$
Direction of Opening	Up
Values x may take (domain)	$\{X \in \mathbb{R}\}$
Values y may take (range)	$\{Y \in \mathbb{R} \mid y \geq -15\}$

x	y
2	-13
3	-14.5
4	-15
5	-14.5
6	-13