

1) Complete the table of properties for each quadratic

a)  $y = (x - 4)^2$

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

<b>Vertex</b>	
<b>Axis of Symmetry</b>	
<b>Direction of Opening</b>	
<b>Values <math>x</math> may take (domain)</b>	
<b>Values <math>y</math> may take (range)</b>	

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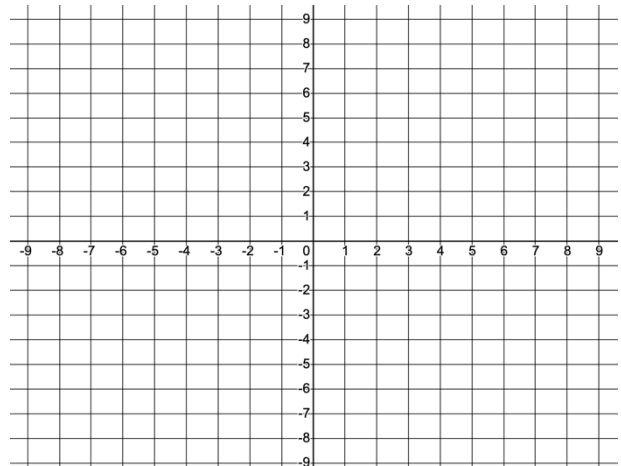
2) Write an equation for the parabola with vertex at  $(2,3)$ , opening upward, and with no vertical stretch.

3) Write an equation for the parabola with vertex at  $(-3,0)$ , opening downward, and with a vertical stretch by a factor of 2.

4) Write an equation for the parabola with vertex at  $(4, -1)$ , opening upward, and with a vertical compression by a factor of  $\frac{1}{3}$ .

5) The graph of  $y = x^2$  is stretched vertically by a factor of 3 and then translated 2 units to the left and 1 unit down. Write the equation of the parabola and then sketch it using a table of values.

$x$	$y$



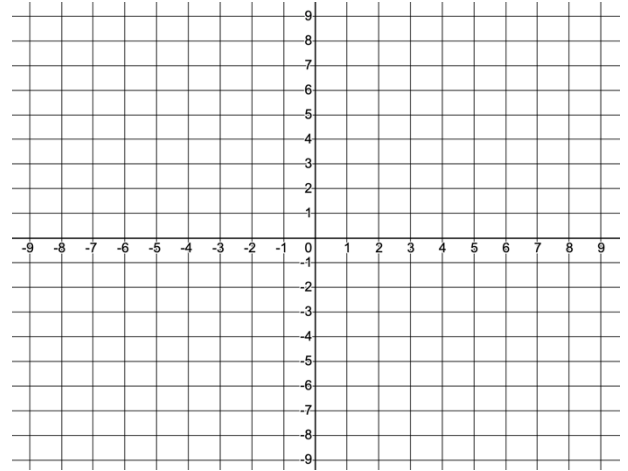
6) For each of the following functions, **i)** describe the transformations compared to  $y = x^2$ , **ii)** complete the table of properties, **iii)** graph the function by making a table of values

a)  $y = -\frac{1}{4}(x - 3)^2 + 6$

Transformations:

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

$x$	$y$
1	5
2	5.75
3	6
4	5.75
5	5

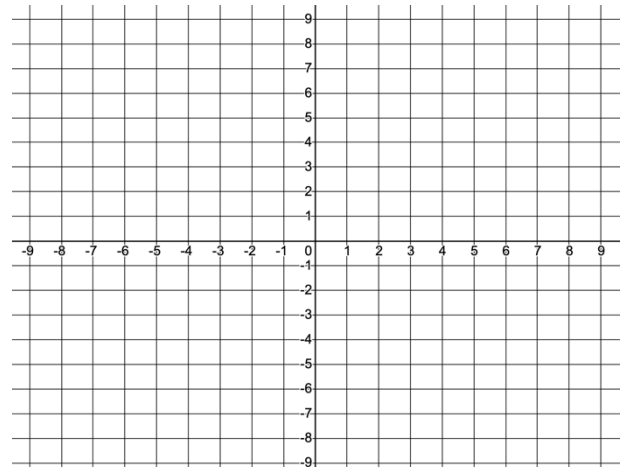


b)  $y = 2(x + 1)^2 - 5$

Transformations:

Vertex	$(-1, -5)$
Axis of Symmetry	$x = -1$
Direction of Opening	UP
Values $x$ may take (domain)	$\{X \in \mathbb{R}\}$
Values $y$ may take (range)	$\{Y \in \mathbb{R}   y \geq -5\}$

$x$	$y$
-3	3
-2	-3
-1	-5
0	-3
1	3

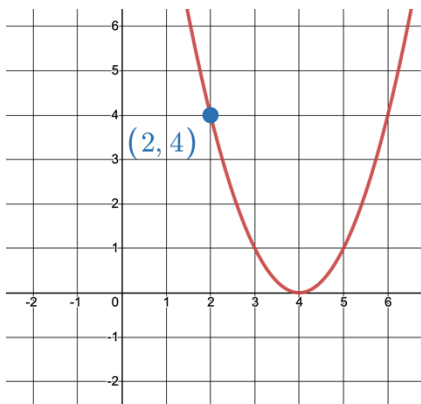


7) The graph of  $y = x^2$  is compressed vertically by a factor of  $\frac{1}{2}$ , reflected in the  $x$ -axis, and then translated 2 units up. Write the equation of the parabola.

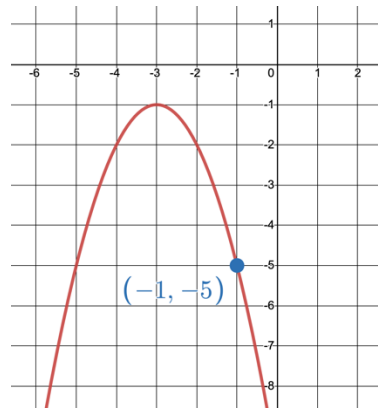
8) Describe the transformations from  $y = x^2$  to  $y = -5(x + 4)^2 + 7$

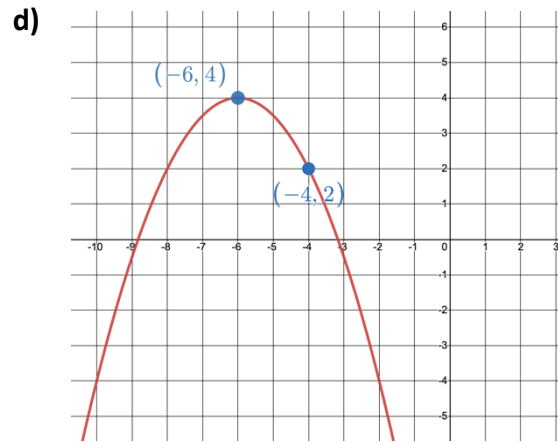
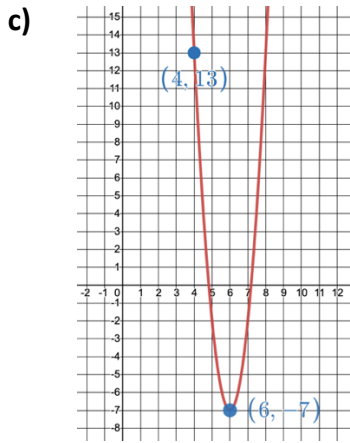
9) Write an equation, in vertex form, for each parabola.

a)



b)





**10)** A baseball is batted at a height of 1 meter above the ground and reaches a maximum height of 33 meters at a horizontal distance of 4 meters.

**a)** Determine an equation to model the path of the baseball in vertex form.

**b)** What is the height of the baseball once it has travelled a horizontal distance of 6 meters?

**c)** At what other horizontal distance is the baseball at the same height as in part b) ?

**11)** The flight path of a firework is modeled by the relation  $h = -5(t - 5)^2 + 127$ , where  $h$  is the height, in meters, of the firework above the ground and  $t$  is the time, in seconds, since the firework was fired.

**a)** What is the maximum height reached by the firework? How many seconds after it was fired does the firework reach this height?

**b)** How high was the firework above the ground when it was fired?

## Answers

**1)a)**

Vertex	(4,0)
Axis of Symmetry	$x = 4$
Direction of Opening	UP
Values $x$ may take (domain)	$\{X \in \mathbb{R}\}$
Values $y$ may take (range)	$\{Y \in \mathbb{R}   y \geq 0\}$

**b)**

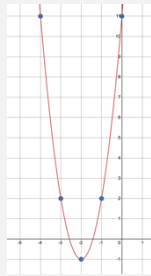
Vertex	(-2,-5)
Axis of Symmetry	$x = -2$
Direction of Opening	Down
Values $x$ may take (domain)	$\{X \in \mathbb{R}\}$
Values $y$ may take (range)	$\{Y \in \mathbb{R}   y \leq -5\}$

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

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

**4)**  $y = \frac{1}{3}(x - 4)^2 - 1$

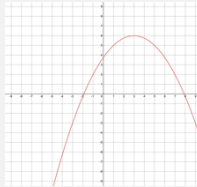
**5)**  $y = 3(x + 2)^2 - 1$ ;



**6)a)** Vertical reflection; vertical compression by a factor of  $\frac{1}{4}$ ; shift right 3; shift up 6

Vertex	(3,6)
Axis of Symmetry	$x = 3$
Direction of Opening	Down
Values $x$ may take (domain)	$\{X \in \mathbb{R}\}$
Values $y$ may take (range)	$\{Y \in \mathbb{R}   y \leq 6\}$

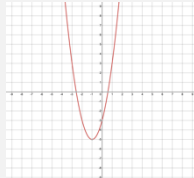
$x$	$y$
1	5
2	5.75
3	6
4	5.75
5	5



**b)** Vertical stretch by a factor of 2; shift left 1 unit; shift down 5 units

Vertex	(-1,-5)
Axis of Symmetry	$x = -1$
Direction of Opening	UP
Values $x$ may take (domain)	$\{X \in \mathbb{R}\}$
Values $y$ may take (range)	$\{Y \in \mathbb{R}   y \geq -5\}$

$x$	$y$
-3	3
-2	-3
-1	-5
0	-3
1	3



**7)**  $y = -\frac{1}{2}x^2 + 2$

**8)** Vertical reflection; vertical stretch by a factor of 5; shift left 4 units; shift up 7 units

**9)a)**  $y = (x - 4)^2$  **b)**  $y = -(x + 3)^2 - 1$  **c)**  $y = -5(x - 4)^2 + 13$  **d)**  $y = -\frac{1}{2}(x + 6)^2 + 4$

**10)a)**  $h = -2(d - 4)^2 + 33$  **b)** 25 m **c)** 2 m

**11)a)** 127 m; 5 seconds **b)** 2 meters