L2 –Quadratics in Vertex Form Unit 4
MPM2D
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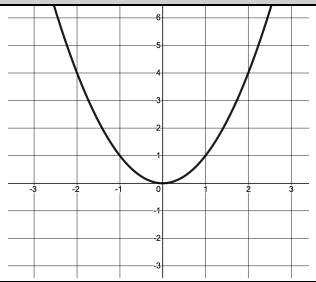
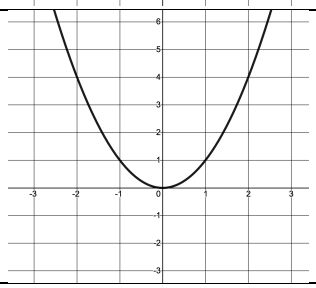
Standard Form: $y = ax^2 + bx + c$

Vertex Form: $y = a(x - h)^2 + k$

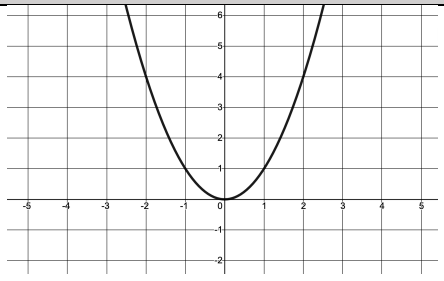
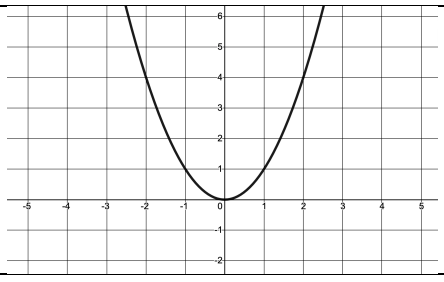
Factored Form: $y = a(x - r)(x - s)$

Part 1: Effects of a, h, and k on transforming the graph of $y = x^2$

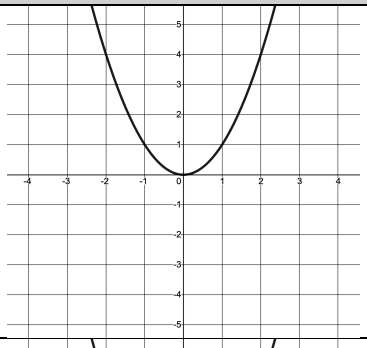
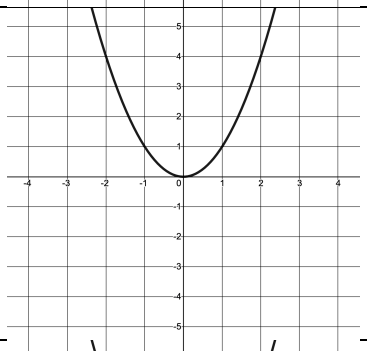
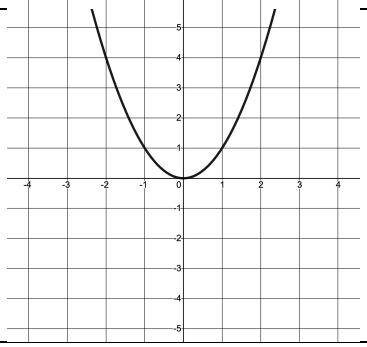
The effects of the k parameter on the graph of $y = x^2 + k$

Function	Graph	Vertex	Axis of Symmetry	Transformations
$y = x^2 + 3$				
$y = x^2 - 2$				

The effects of the h parameter on the graph of $y = (x - h)^2$

Function	Graph	Vertex	Axis of Symmetry	Transformations
$y = (x - 2)^2$				
$y = (x + 3)^2$				

The effects of the a parameter on the graph of $y = ax^2$

Function	Graph	Vertex	Axis of Symmetry	Transformations
$y = 2x^2$				
$y = \frac{1}{2}x^2$				
$y = -\frac{1}{2}x^2$				

Properties of $y = a(x - h)^2 + k$

$a > 0$ →
$a < 0$ →
$a > 1$ or $a < -1$ →
$-1 < a < 1$ →

$h > 0$ →
$h < 0$ →

$k > 0$ →
$k < 0$ →

Vertex is at

Axis of symmetry is at

The domain (values x may take) of all quadratic functions is $X \in \mathbb{R}$

The range (values y may take) depends on the location of the vertex

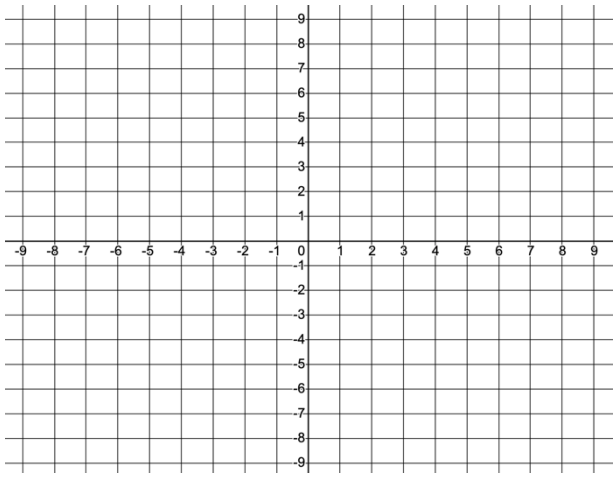
Example 1: For each of the following functions, **i)** describe the transformations compared to $y = x^2$, **ii)** complete the table of properties, **iii)** graph the function by making a table of values

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

Transformations:

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

x	y

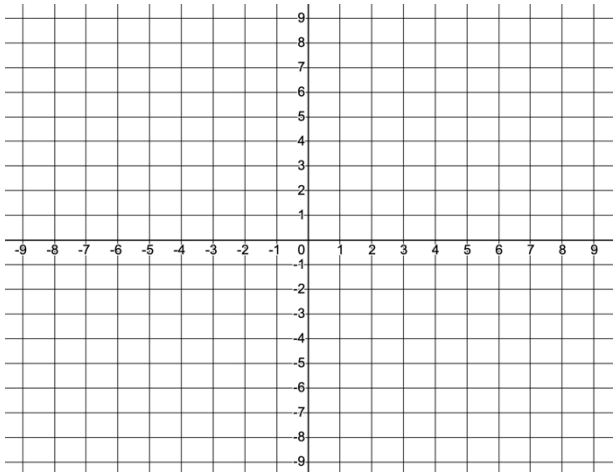


b) $y = 2x^2 - 5$

Transformations:

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

x	y

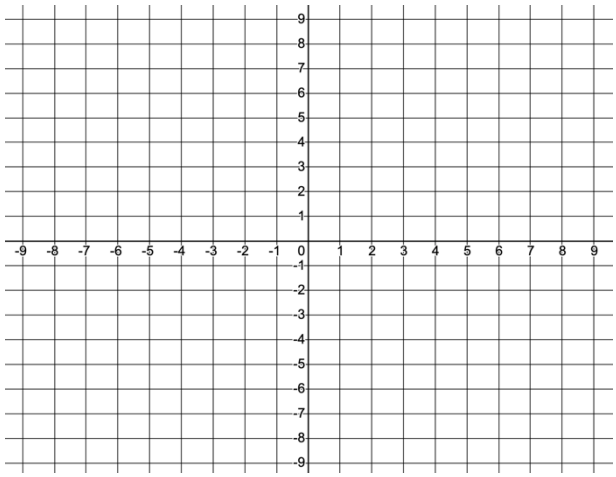


c) $y = 2(x - 3)^2 + 1$

Transformations:

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

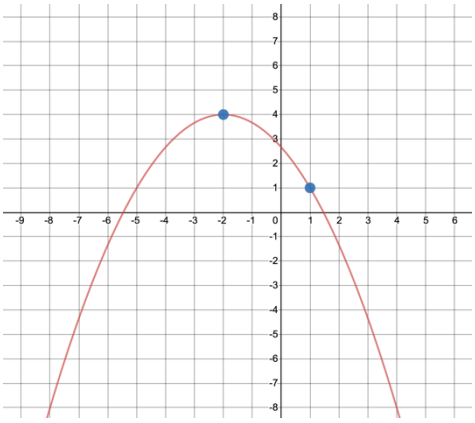
x	y



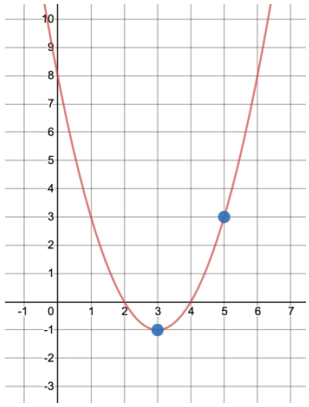
Example 2: Determine the vertex form equation of the parabola with its vertex at $(1,5)$ and passes through the point $(0,2)$

Example 3: Determine the vertex form equation of the following parabolas

a)



b)



Example 4: The graph of $y = x^2$ is reflected vertically in the x-axis, compressed vertically by a factor of $\frac{1}{4}$, shifted 1 unit to the left, and 2 units down. Write the vertex form equation of this parabola.

Example 5: At a fireworks display, a firework is launched from a height of 2 meters above the ground and reaches a max height of 40 meters at a horizontal distance of 10 meters. The firework continues to travel an additional 1 meter horizontally after it reaches its max height before it explodes. What is the height when it explodes?