2. 5 Graphing Quadratics

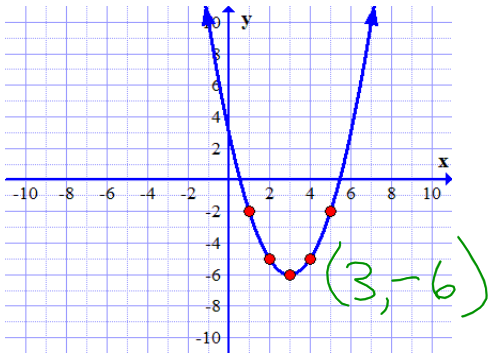
$y=a(x-h)^2+k$

Vertex (h, k)

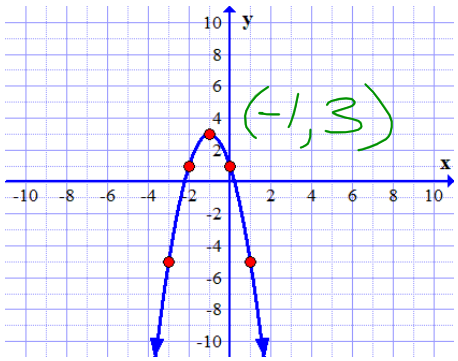
Vertical stretch: a

Example 1: Express the equation of each of the following parabolas in the form $y=a(x-h)^2+k$

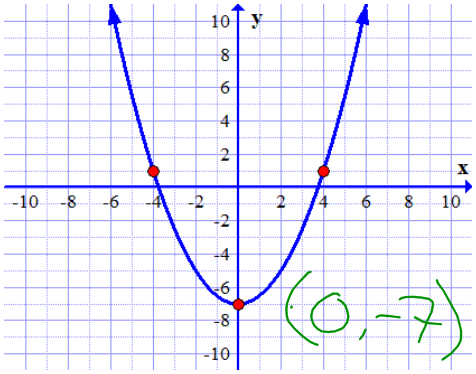
a) $y=1(x-3)^2-6$



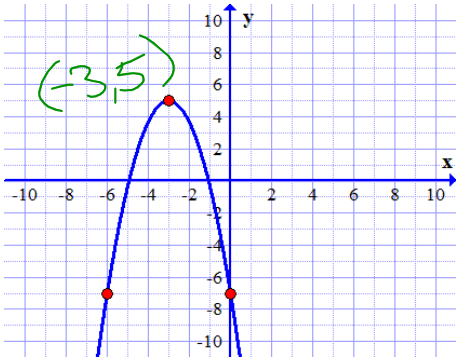
b) $y=-2(x+1)^2+3$



c) $y=\frac{1}{2}(x)^2-7$



d) $y=-\frac{4}{3}(x+3)^2+5$



Methods for graphing parabolas :

A) Vertex form $y=a(x-h)^2+k$ $\Rightarrow$ Complete the square

B) Partial Factored form $y=ax(x-s)+t$

C) Factored form (zeroes or roots) $y=a(x-b)(x-c)$

D) Table of values (not recommended at the 3U level)

A) Vertex form $y=a(x-h)^2+k$

1- Plot vertex (h,k)

2- Using the table of values of $y=x^2$, multiply the y-values by a.

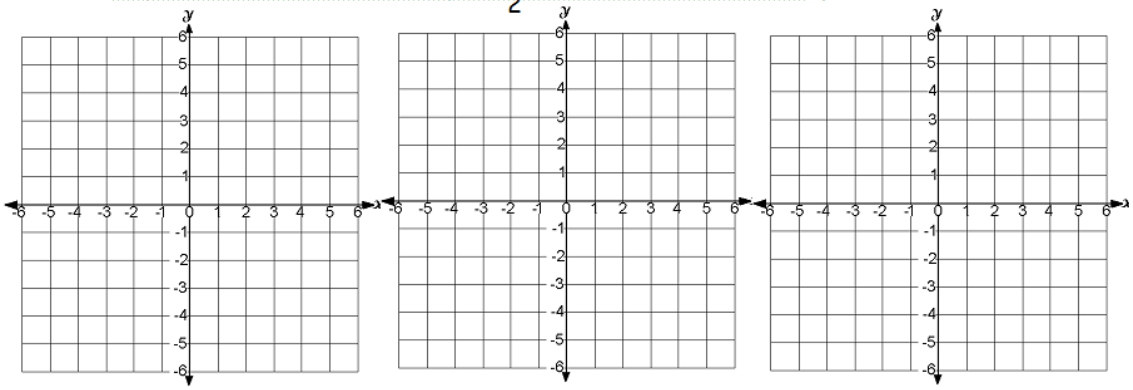
3- From the vertex move and plot the points using x and ay

x	$y=x^2$	ay
2		
1		
0		
-1		
-2		

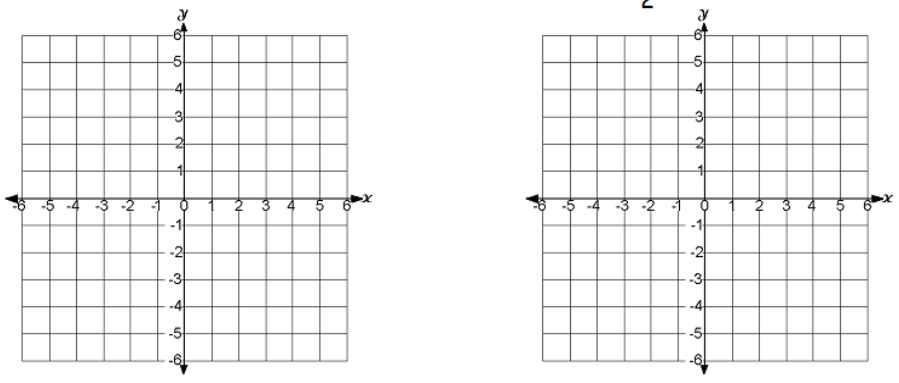
Move right if x is positive and left if negative
Move up if ay is positive and down if negative

Equation	Direction of Opening	Vertex	Axis of symmetry	Max or Min Value	Vert. Stretch or compression
a) $y=2(x-3)^2-4$					
b) $y=-\frac{1}{2}(x+2)^2+3$					
c) $y=x^2-4x+5$					
d) $y=-3x^2+6x+1$					
e) $y=\frac{1}{2}x^2+4x+5$					

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



d) $y=-3x^2+6x+1$ e) $y=\frac{1}{2}x^2+4x+5$

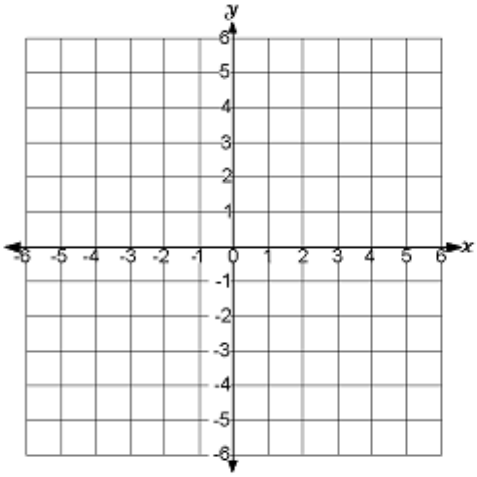


B) Partial Factored form $y=ax(x-s)+t$

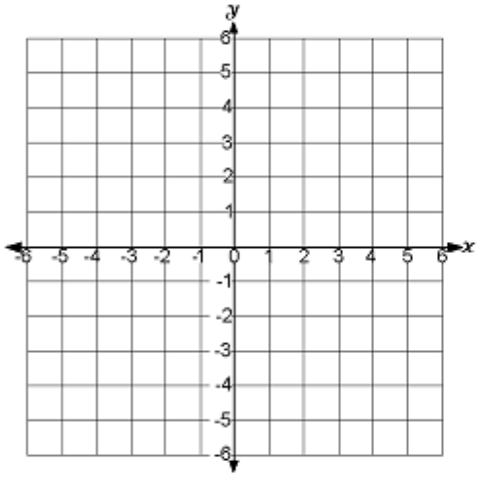
1- Factor the first two terms by removing the common factor ax
2- Substitute the value of 0 for x to find the first point $(0, t)$
3- Substitute the value of s for x to find the second point (s, t)
4 – Plot the two points
5- Identify the axis of symmetry (halfway btw 0 and s)
6- Substitute the value of the axis of symmetry for x in the initial equation to find the coordinates of the vertex.

Equation $y=ax^2+bx+c$	Equation $y=ax(x-s)+t$	Coordinate of 1st point	Coordinate of 2nd point	Axis of symmetry	Coordinates of Vertex
a) $y = 2x^2 + 4x - 3$					
b) $y = -3x^2 - 6x + 1$					
c) $y = 5x^2 - 10x + 2$					
d) $y = -4x^2 - 12x - 3$					

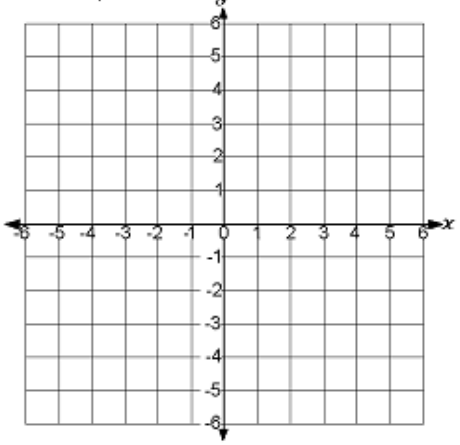
a) $y = 2x^2 + 4x - 3$



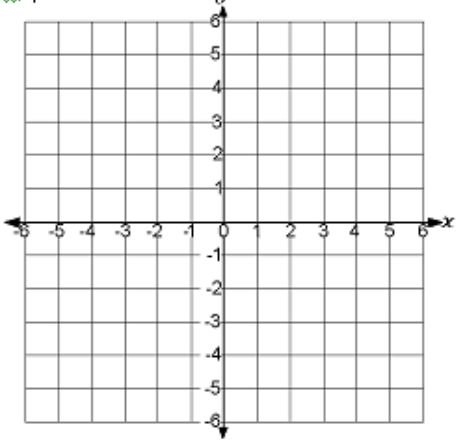
b) $y = -3x^2 - 6x + 1$



c) $y = 5x^2 - 10x + 2$



d) $y = -4x^2 - 12x - 3$

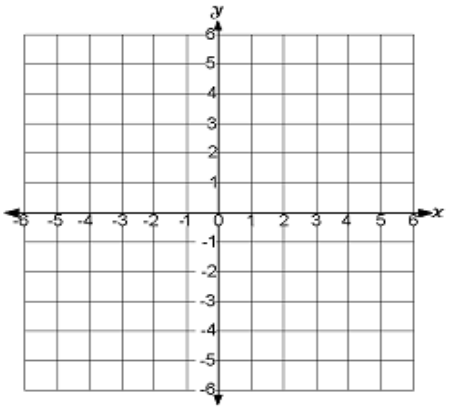


C) Factored form (zeroes or roots) y=a(x-b) (x-c)

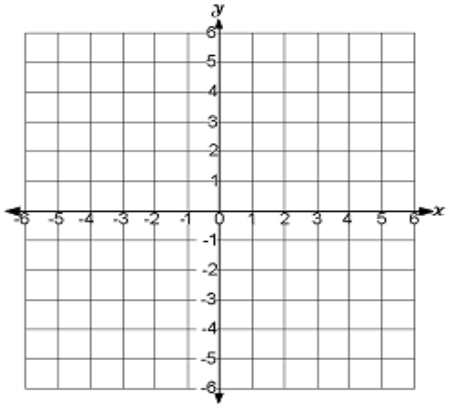
1- Factor and set equation equal to zero
2- Solve to find roots *b* and *c* (those are the x- intercepts)
3- Identify the axis of symmetry (halfway btw *b* and *c*)
4- Substitute the value of the axis of symmetry for x in the initial equation to find the coordinates of the vertex.

Equation $y=ax^2+bx+c$	Equation y=a(x-b)(x-c)	Solve to find b and c	Axis of symmetry	Coordinates of Vertex	Vert. stretch/comp
a) $y = x^2 - 6x + 8$					
b) $y = -x^2 + 6x - 5$					
c) $y = 2x^2 - 2$					
d) $y = x^2 + 7x + 10$					

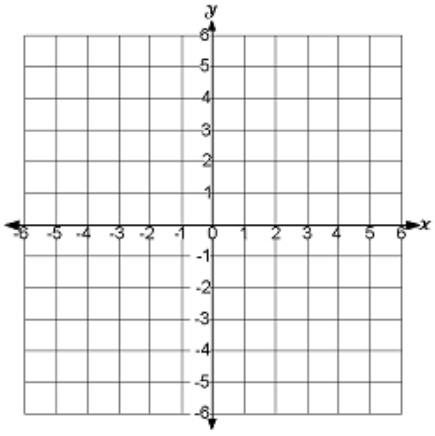
a) $y = x^2 - 6x + 8$



b) $y = -x^2 + 6x - 5$



c) $y = 2x^2 - 2$



d) $y = x^2 + 7x + 10$