

4.2 Standard Form of a Quadratic Function

Main Ideas/Questions	Notes/Examples
Standard Form of a Quadratic Function	$y = ax^2 + bx + c$
Parts of a Parabola	<ul style="list-style-type: none"> Axis of symmetry $x = -\frac{b}{2a}$ The x-coordinate of the vertex: $x = -\frac{b}{2a}$ The y-coordinate of the vertex: $f(-\frac{b}{2a})$ *plug in x The y-intercept: $(0, c)$
Using the information from above, find the features of the following quadratic functions.	
1. $y = -3x^2 - 6x + 8$ $\begin{matrix} a & b & c \end{matrix}$ AOS: $x = -1$ Vertex: $(-1, 11)$ Max/Min: $y = 11$ Domain: \mathbb{R} Range: $[-\infty, 11]$ Y-Intercept: $(0, 8)$	2. $y = x^2 - 8x + 9$ $\begin{matrix} a & b & c \end{matrix}$ $\frac{8}{2(1)} = 4$ \cup AOS: $x = 4$ Vertex: $(4, -7)$ Max/Min: $y = -7$ Domain: \mathbb{R} Range: $[-7, \infty)$ Y-Intercept: $(0, 9)$
3. $y = -x^2 + 6x$ $\begin{matrix} a & b & c \end{matrix}$ AOS: $x = 3$ Vertex: $(3, 9)$ Max/Min: $y = 9$ Domain: \mathbb{R} Range: $(-\infty, 9]$ Y-Intercept: $(0, 0)$	4. $y = -2x^2 + 7$ $\begin{matrix} a & b & c \end{matrix}$ $\frac{0}{2(-2)} = 0$ \cap AOS: $x = 0$ Vertex: $(0, 7)$ Max/Min: $y = 7$ Domain: \mathbb{R} Range: $(-\infty, 7]$ Y-Intercept: $(0, 7)$
Steps to Graph a Quadratic in Standard Form	<ol style="list-style-type: none"> 1. Identify a, b, and c 2. Determine the shape of the graph (up/down) 3. Find the axis of symmetry 4. Find the vertex 5. Use 1a, 3a, 5a pattern to graph from the vertex 6. Reflect over the axis of symmetry

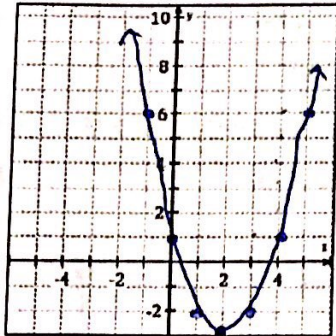
7. Graph $y = a^2x^2 - 4x + 1$

Vertex: $(2, -3)$

Domain: \mathbb{R}

Range: $[-3, \infty)$

$\frac{4}{2(1)} = 2$ $1a = 1$
 $3a = 3$
 $5a = 5$
 $2^2 - 4(2) + 1$
 $4 - 8 + 1 = -3$



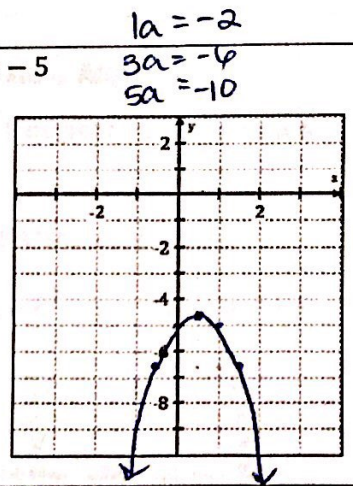
8. Graph $y = -2x^2 + 2x - 5$

Vertex: $(\frac{1}{2}, -\frac{9}{2})$

Domain: \mathbb{R}

Range: $(-\infty, -\frac{9}{2}]$

$\frac{-2}{2(-2)} = \frac{1}{2}$
 $-2(\frac{1}{2})^2 + 2(\frac{1}{2}) - 5$
 $-2(\frac{1}{4}) + 1 - 5$
 $-\frac{1}{2} - 4 = -\frac{9}{2}$



Finding Vertex Form from Standard Form

1. Find the vertex (h, k)
2. Find "a" value
3. Plug a, h, k into vertex form

9. Find the vertex form for $f(x) = 2x^2 - 8x - 3$

$\frac{8}{2(2)} = 2$ $2(2^2) - 8(2) - 3$ $(2, -11)$
 $8 - 16 - 3$
 $-8 - 3$
 -11

$a = 2$
 $h = +2$
 $k = -11$

$y = 2(x+2)^2 - 11$

10. Find the vertex form for $f(x) = -x^2 + 4x - 5$

$\frac{-4}{2(-1)} = 2$ $- (2)^2 + 4(2) - 5$
 $-4 + 8 - 5$
 -1 $(2, -1)$

$a = -1$
 $h = 2$
 $k = -1$

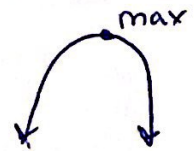
$y = -(x-2)^2 - 1$

11. A model for the performance of a stock is $P = -3d^2 + 50d$, where d represents the days of trading and P is the price per share. What is the maximum price per share of the stock?

Find the y -value of the vertex

$\frac{+50}{2(3)} = \frac{50}{6} = \frac{25}{3}$

$\frac{-625}{3} + \frac{1250}{3} = \frac{625}{3} = \208.33



$-3(\frac{25}{3})^2 + 50(\frac{25}{3})$

$-\frac{3}{3}(\frac{625}{9}) + \frac{1250}{9}$