Section 11.3 Graphing Parabolas

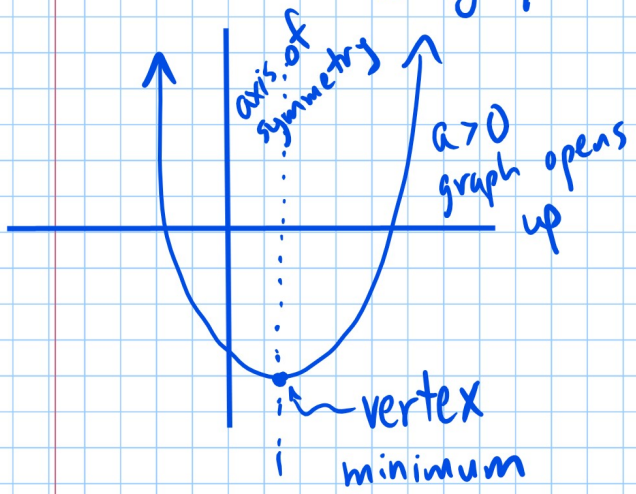
Standard Form

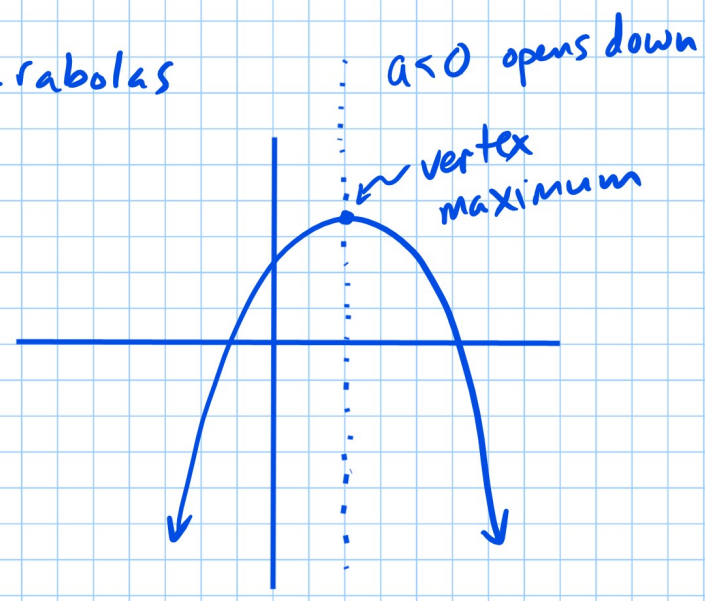
$f(x) = ax^2 + bx + c$

Vertex Form

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

The graphs are parabolas





To graph a parabola in $f(x) = ax^2 + bx + c$ form:

1) Determine if it opens up or down.
2) Determine the axis of symmetry which is $x = \frac{-b}{2a}$
3) Determine the vertex which is $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$
4) Determine x-intercepts by setting $ax^2 + bx + c = 0$
5) The y-intercept is $(0, c)$.
6) Graph It.

ex: $f(x) = x^2 + 2x - 8$

$a = 1 \quad b = 2 \quad c = -8$

1) opens up since $a = 1 > 0$

2) Axis $x = \frac{-b}{2a} = \frac{-2}{2 \cdot 1} = \frac{-2}{2} = -1$

$x = -1$ is axis of symm.

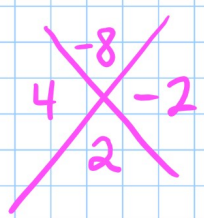
3) $f(-1) = (-1)^2 + 2(-1) - 8$

$= 1 - 2 - 8$

$= -9$

vertex is $(-1, -9)$

4) $x^2 + 2x - 8 = 0$



$(x+4)(x-2) = 0$

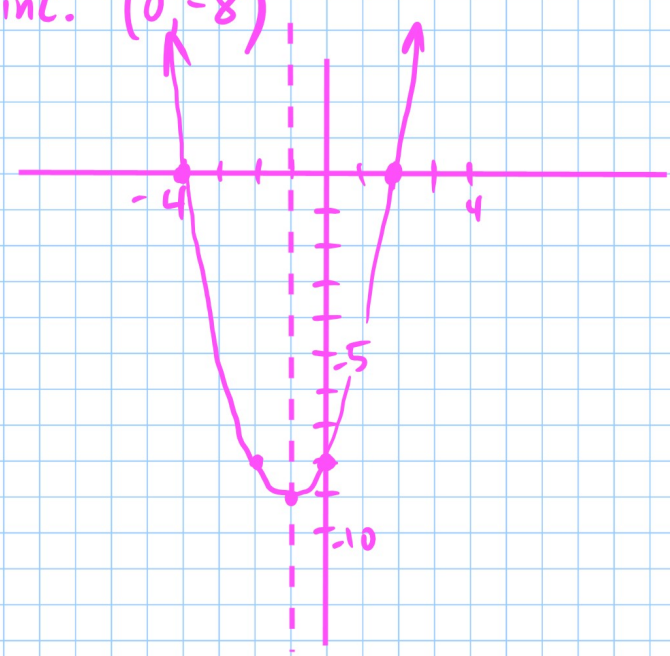
$x+4=0$ $\quad$ $x-2=0$

$x=-4$ $\quad$ $x=2$

$(-4,0), (2,0)$

5) y-int. $(0,-8)$

6)



Vertex Form

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

To graph:

1) Determine if it opens up or down

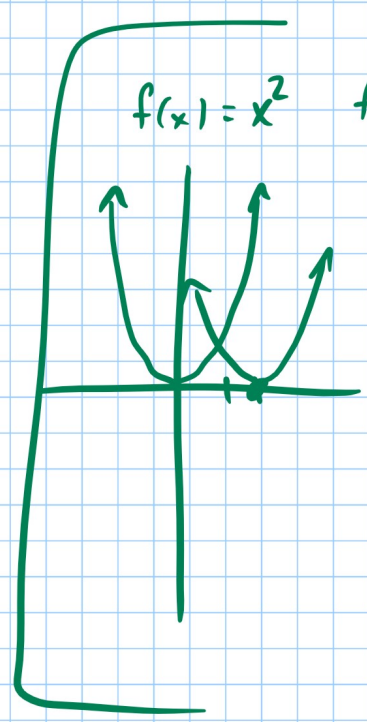
2) Determine axis of symmetry which is $x=h$

3) Determine vertex which is (h,k)

4) x-ints: $a(x-h)^2+k=0$

5) y-int: $(0, f(0))$

6) Graph It.



x	y
-2	16
-1	9
0	4
1	1
2	0
3	1
4	4

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

ex: $f(x) = -(x-3)^2+4$

1) opens down

2) Axis: $x=3$

3) Vertex: $(3,4)$

4) $-(x-3)^2 \cancel{+4} = 0$
$\cancel{-4}$ -4

$(-1)(-(x-3)^2 = -4)$

$(x-3)^2 = 4$

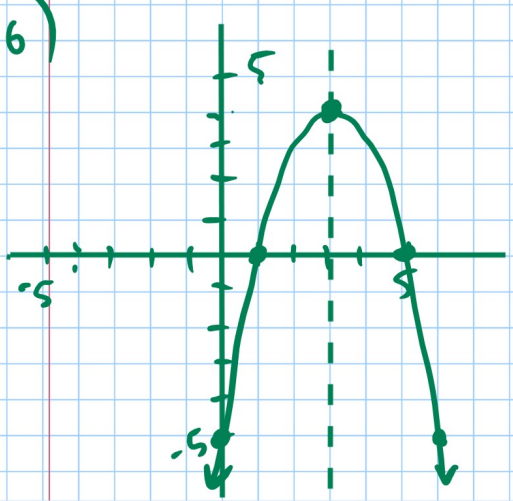
$x-3 = \pm\sqrt{4}$

$x-3 = \pm 2$

$x = 3+2 = 5$
$(5,0)$

$x = 3-2 = 1$
$(1,0)$

5) $f(0) = -(0-3)^2+4$
$= -(-3)^2+4$
$= -9+4$
$= -5$

$(0,-5)$

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