1.1: Graphing Quadratic Functions in Standard Form

Standard form: $y = \underbrace{\boxed{ax^2}}_{\text{Quadradic Term}} + \overbrace{\boxed{bx}}^{\text{Linear term}} + \underbrace{\boxed{c}}_{\text{constant term}}$

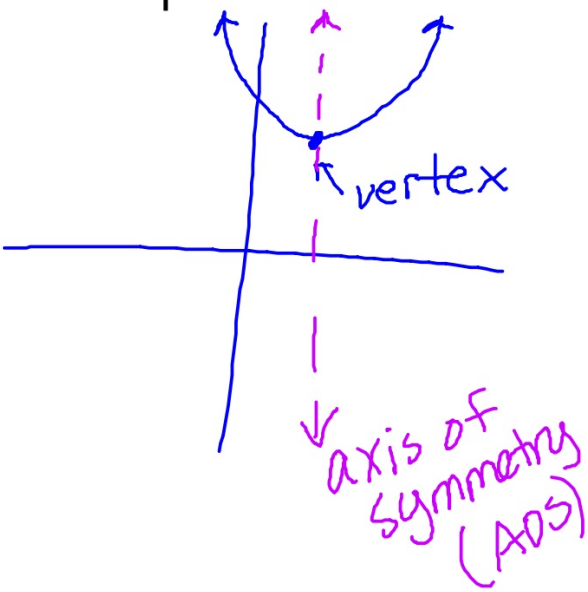
Coefficients:

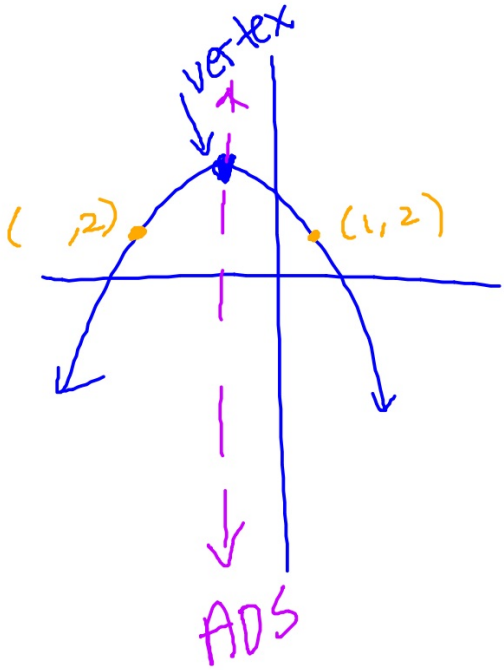
$a \in R, a \neq 0$

$b \in R$

$c \in R$

Graph: Parabola

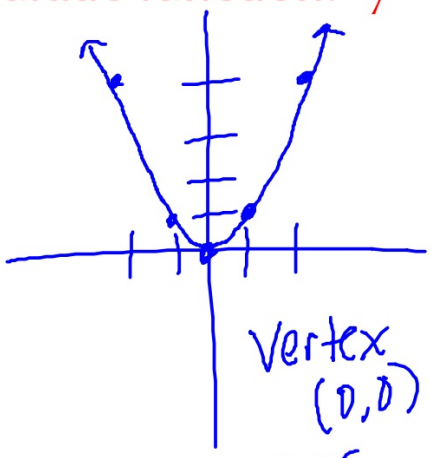




Parent function: the simplest form of a function

Parent quadratic function: $y = x^2$

x	y
-2	4
-1	1
0	0
1	1
2	4



Vertex
(0,0)

AOS
$x=0$

Interval

D: $(-\infty, \infty)$

R: $[0, \infty)$

Set

D: $\{x \mid x \in R\}$

R: $\{y \mid y \geq 0\}$

state the Vertex, AOS, Domain and Range, and sketch.

$x = -b/(2a)$

a) $y = 3x^2 - 12x + 4$

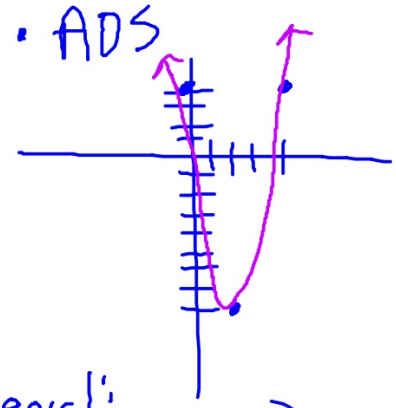
- x-value of vertex
- AOS

AOS: $x = \frac{-(-12)}{2(3)}$

$a = 3$
$b = -12$

$\boxed{x = 2 \text{ AOS}}$

x	y
0	4
2	-8
4	4



$\boxed{\text{Vertex } (2, -8)}$

$y = 3(2)^2 - 12(2) + 4$
$y = -8$

Interval:
D: $(-\infty, \infty)$
R: $[-8, \infty)$

State the AOS, vertex, sketch and then state domain and range (set notation)

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

AOS: $x = \frac{-(-6)}{2(-1)}$

$a = -1$

$b = -6$

$\boxed{x = -3}$ AOS

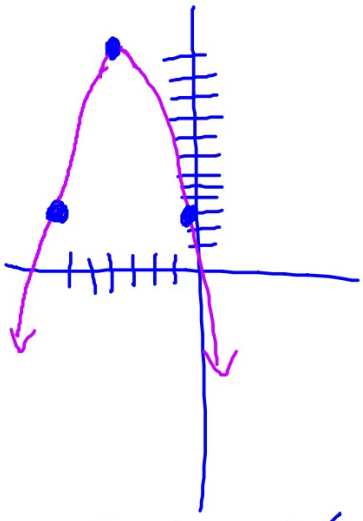
$y = -(-3)^2 - 6(-3) + 3$

$y = -9 + 18 + 3$

$y = 12$

$\boxed{(-3, 12)}$ vertex

x	y
-6	3
-3	12
0	3



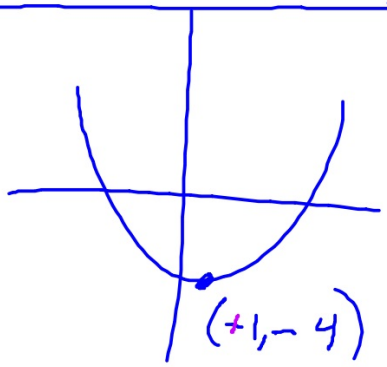
D: $\{x \mid x \in R\}$

R: $\{y \mid y \leq 12\}$

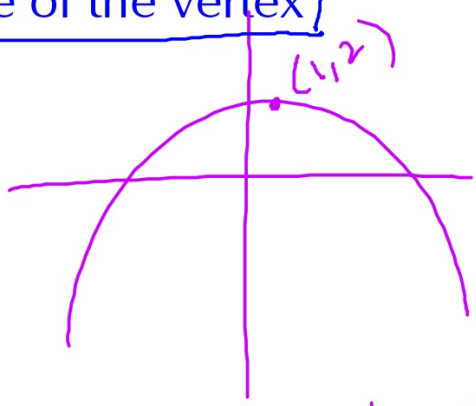
There is either a max or a min for a parabola.

Maximums and minimums: always at the <u>vertex</u>

$\boxed{\text{Max or min value: y-value of the vertex}}$



min value is −4



max value is 2

$$y = ax^2 + bx + c$$

a) When does the graph open up?

$a > 0$

b) When does the graph open down?

$a < 0$

d) Axis of Symmetry (AOS)

$$x = \frac{-b}{2a}$$

$f(x) = -0.5x^2 + 3$ or $y = -\frac{1}{2}x^2 + 3$

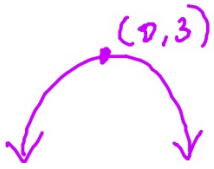
a) Direction of opening?

down

V: (0,3)

b) Max value/min value?

max value is 3



c) AOS

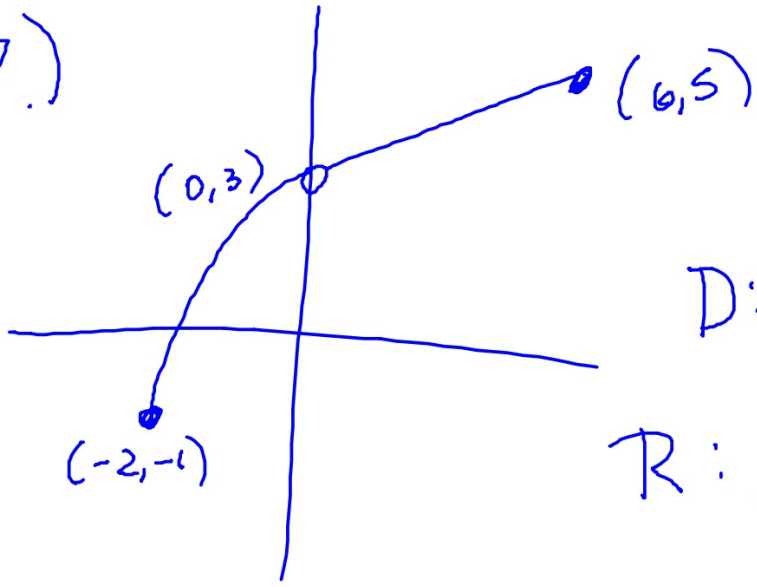
$x = 0$

d) D/R in any notation

D: $\{x \mid x \in \mathbb{R}\}$ $(-\infty, \infty)$

R: $\{y \mid y \leq 3\}$ $(-\infty, 3]$

7.)



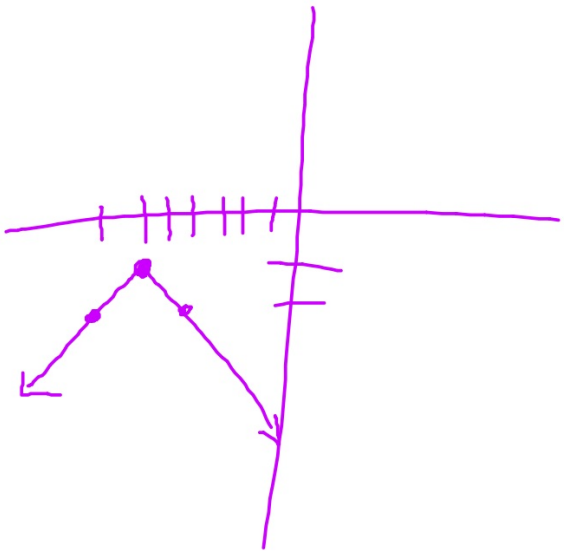
interval

D: $[-2,0) \cup (0,6]$

R: $[-1,3) \cup (3,5]$

10.) $y = -|x+6| - 1$

x	y
-5	-2
-6	-1
-7	-2



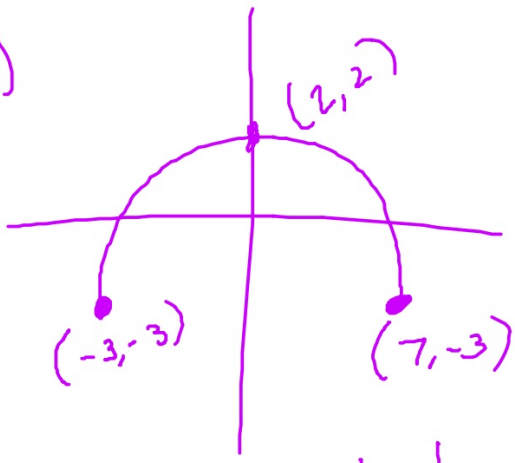
Set

D: $\{x \mid x \in R\}$

R: $\{y \mid y \leq -1\}$

Table of values: Hint: make a sketch

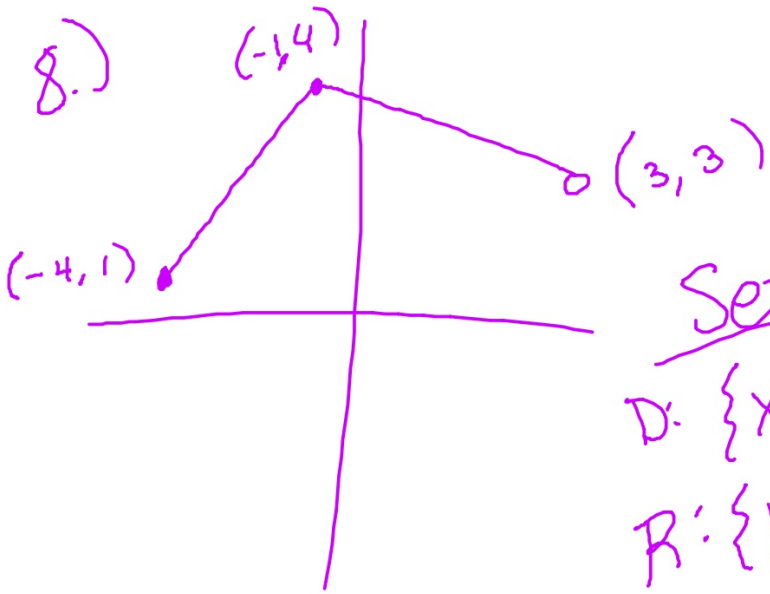
6.)



set : $\{x \mid -3 \le x \le 7\}$ D

$\{y \mid -3 \le y \le 2$ R

8.)



Set

D: $\{x \mid -4 \leq x < 3\}$

R: $\{y \mid 1 \leq y \leq 4\}$