Range: not a whole #

Set: $\{y \mid y \notin W\}$

---

Range: Empty set

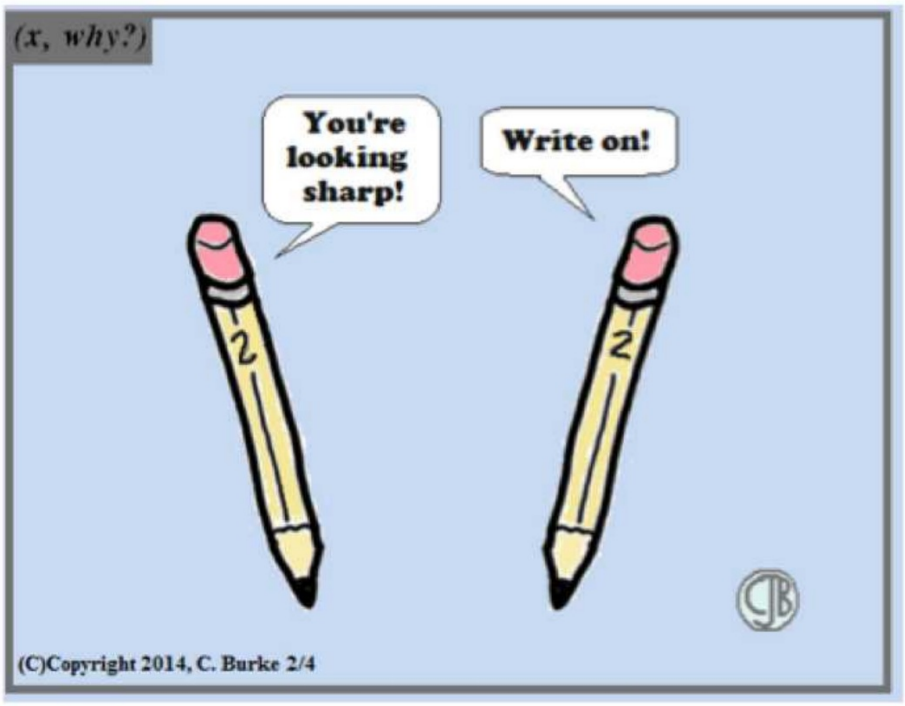
Set: $\{\}$ or $\emptyset$

Interval: $\emptyset$

$5x-1 > 5x+5$

$0 > 6$

# Domain and Range



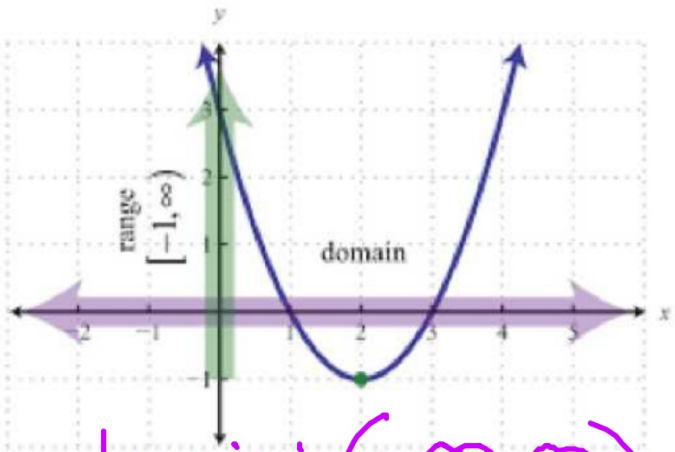

*See printout.


domain - possible values of x for the graph

range - possible values of y for the graph

Questions to consider before finding domain and range...

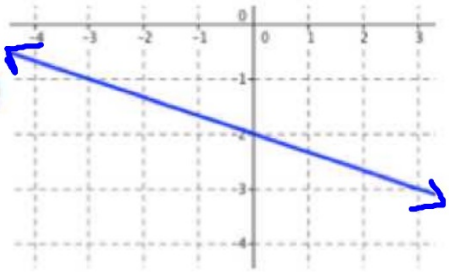
- Does the graph open "left/right" forever?
- Does the open "up/down" forever?
- Can you trace the graph without lifting your pencil?



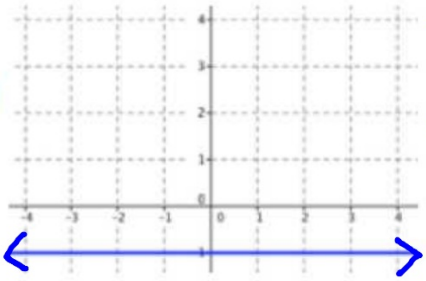

domain: $(-\infty, \infty)$

ex: State the domain and range in set and interval notation.

a)

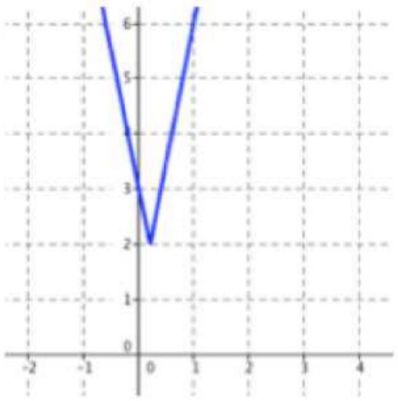


b)



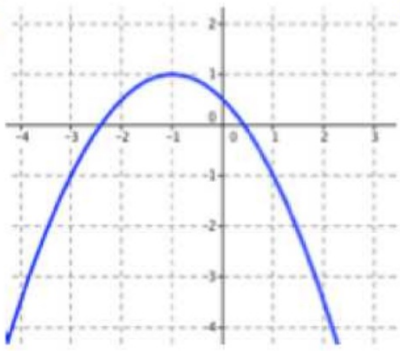
| | Set | Interval |
|---|---|---|
| a) | $D: \{x \mid x \in R\}$ | $(-\infty, \infty)$ |
| | $R: \{y \mid y \in R\}$ | $(-\infty, \infty)$ |
| b) | $D: \{x \mid x \in R\}$ | $(-\infty, \infty)$ |
| | $R: \{y \mid y = -1\}$ | $[-1]$ or $[-1, -1]$ |

c)



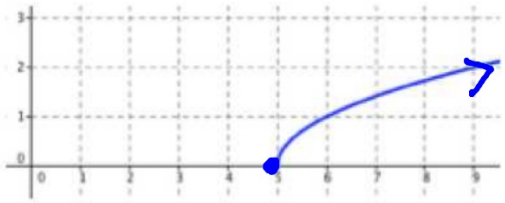
| Set | Interval |
| --- | --- |
| $D: \{x \mid x \in R\}$ | $D: (-\infty, \infty)$ |
| $R: \{y \mid y \geq 2\}$ | $R: [2, \infty)$ |

d)



| | |
| --- | --- |
| $D: \{x \mid x \in R\}$ | $D: (-\infty, \infty$ |
| $R: \{y \mid y \leq 1\}$ | $R: (-\infty, 1]$ |

e)

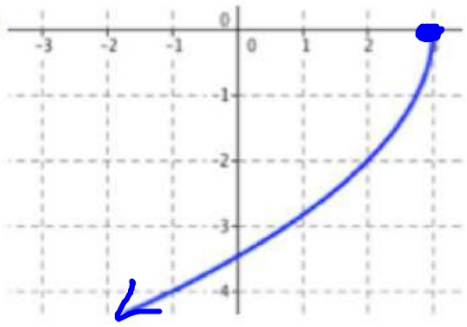


Set

D: $\{x \mid x \geq 5\}$

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

f)

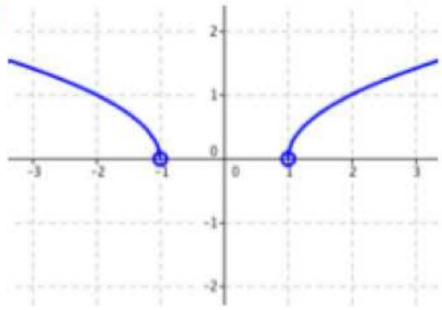


Interval

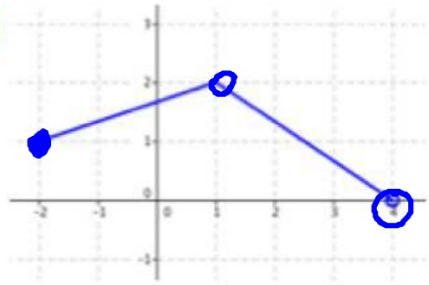
D: $(-\infty, 3]$

R: $(-\infty, 0]$

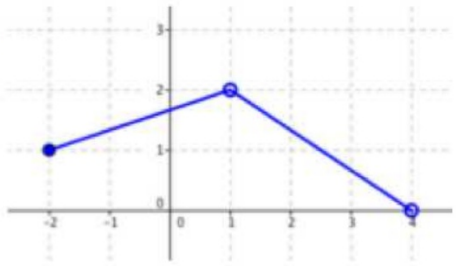
g)



h)



i)



Set

D: $\{x \mid x < -1 \text{ or } x > 1\}$

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

Interval Set: $\{x \mid -2 \le x < 1 \text{ or } 1 < x < 4\}$

D: $[-2, 1) \cup (1, 4)$

R: $(0, 2)$

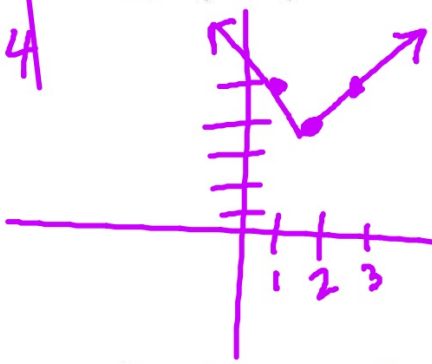
ex: Sketch the graph then state the domain and range in the indicated notation.

$y = a|x-h|+k$

vertex: $(h,k)$

a) interval notation, $y = |x-2|+4$

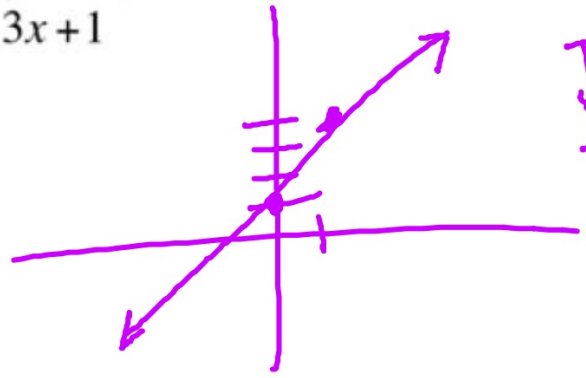
vertex: $(2, 4)$




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

R: $[4, \infty)$

b) set notation, $y = 3x+1$



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

R: $\{y \mid y \in R\}$

## 1.1 Graph Quadratic Functions in Standard Form

**Standard Form:**

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

Quadratic Coefficient — linear coefficient — constant

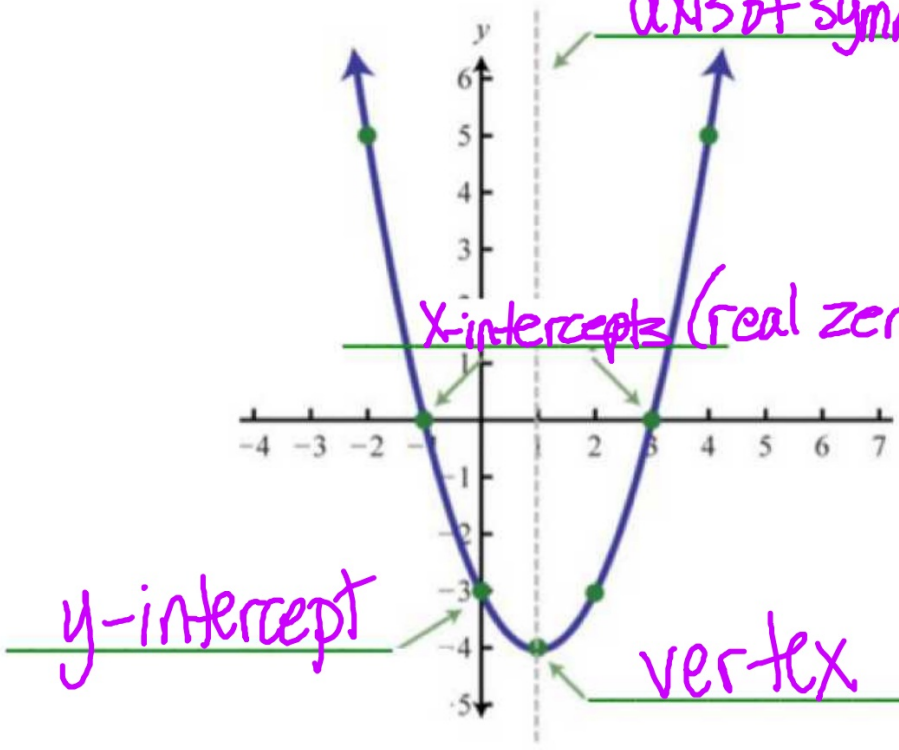
**where:**

a $a \neq 0$

b $\in \mathbb{R}$

c $\in \mathbb{R}$

* The graph of a quadratic is called a Parabola.

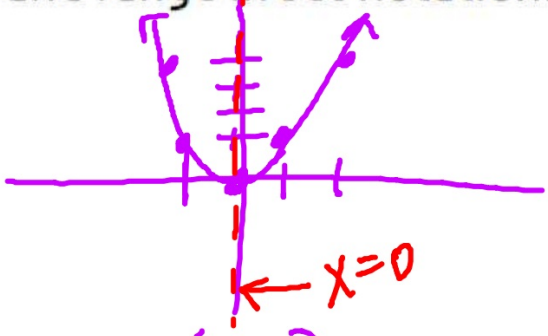


Parent Function - the simplest form of a function

Parent Quadratic Function: $y = x^2$

ex: Sketch $y = x^2$. Then state the vertex, axis of symmetry and domain and range in set notation.

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




Vertex: (0,0) AOS: x=0

Domain: $\{x \mid x \in R\}$ Range: $\{y \mid y \geq 0\}$

To graph a quadratic function in standard form:

- Find the vertex.

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

- Plot at least two other points, one on each side of the vertex.

ex: Sketch, then state the vertex, axis of symmetry and domain and range in the indicated notation.

a) $y = 3x^2 - 12x + 8$

Vertex | $y = 3x^2 - 12x + 8$

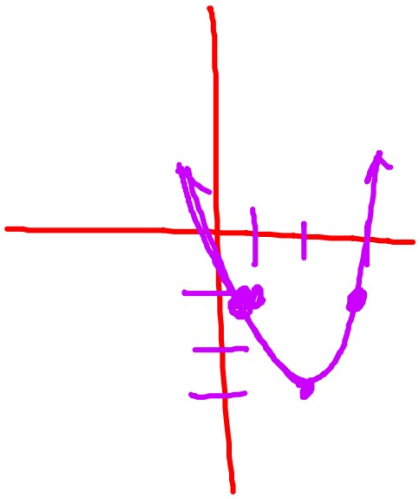
$X = \frac{-b}{2a}$ | $y = -4$

$X = \frac{-(-12)}{2(3)}$

$X = 2$

$(2, -4)$

| X | y |
|---|---|
| 1 | -1 |
| 2 | -4 |
| 3 | -1 |



Vertex: $(2, -4)$ AOS: $X = 2$

(INT) Domain: $(-\infty, \infty)$ Range: $[-4, \infty)$

b) $y = -x^2 - 6x - 4$

Vertex

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

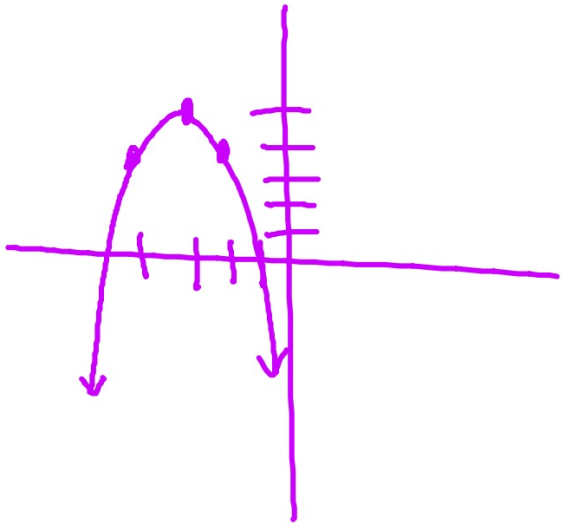
$x = -3$

$y = -(-3)^2 - 6(-3) - 4$

$y = -9 + 18 - 4$

$y = 5$

| x | y |
|---|---|
| -4 | 4 |
| -3 | 5 |
| -2 | 4 |



Vertex: $(-3, 5)$ AOS: $x = -3$

(SET) Domain: $\{x \mid x \in R\}$ Range: $\{y \mid y \leq 5\}$

ex: Consider the graph of: $y = ax^2 + bx + c$

a) When does the graph open up?

$a > 0$

b)When does the graph open down?

$a < 0$

c) What is the axis of symmetry?

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

## Maximum and Mimimum Values

* The maximum or mimimum of a parabola always occurs at the vertex.

*The maximum or mimimum value is the y-value of the vertex

ex: Without graphing, consider the function: $y = -\frac{1}{2}x^2 + 3$

a) What is the direction of opening?

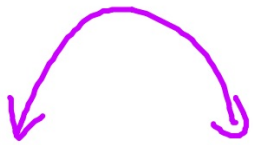
down

b)What is the axis of symmetry?

$x = \frac{-0}{2\left(-\frac{1}{2}\right)} = 0$

$x = 0$

c) What is the maximum/minimum value?



max value: 3

d) State the domain and range in interval notation.

D: $(-\infty, \infty)$ R: $(-\infty, 3]$

ex: The table below represents some points on the graph of a quadratic function.

| x | a | -2 | -1 | 0 | 1 | 6 |
|---|---|---|---|---|---|---|
| y | 45 | -3 | -4 | -3 | 0 | 45 |

a) What is the direction of opening?

UP

b)What is the maximum/minimum value of the quadratic function?

min value: -4

| x | a | -2 | -1 | 0 | 1 | 6 |
|---|---|---|---|---|---|---|
| y | 45 | -3 | -4 | -3 | 0 | 45 |

c) What is the y-intercept?

(0, -3)

d) What are the x-intercepts?

(1, 0) (-3, 0)

e) What is the value of a? -4