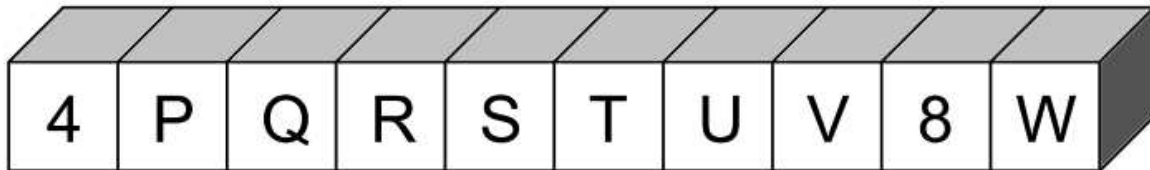


**Problem**

Ten blocks are arranged as illustrated in the following diagram. Each letter shown on the front of a block represents a number. The sum of the numbers on any three consecutive blocks is 19. Determine the value of  $S$ .



$$4 + P + Q = P + Q + R$$

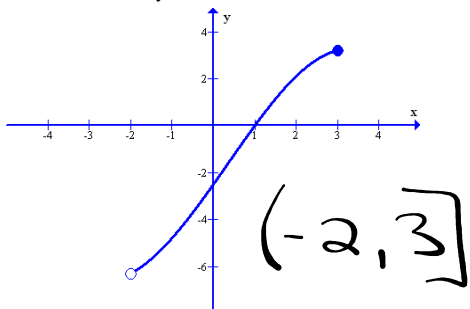
⋮

## 1.3 Key Graph Features of Functions

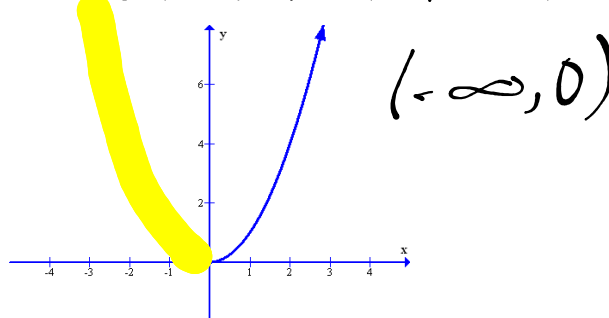
Definitions...

- **Intervals of increase:** interval(s) where  $y$  increases as  $x$  increases.
- **Intervals of decrease:** interval(s) where  $y$  decreases as  $x$  increases.
- **Turning point:** point where the function changes from increasing to decreasing or vice-versa.

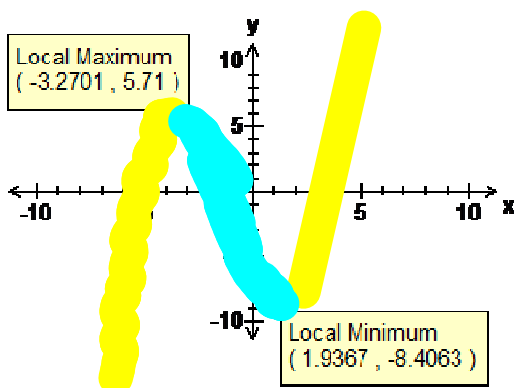
Ex 1. a) State the intervals of increase



b) State the intervals of decrease



Ex 2. State the intervals of increase and decrease



Intervals of increase:

$$x < -3.2701$$

$$x > 1.9367$$

Interval of decrease:

$$-3.2701 < x < 1.9367$$

- Interval notation is a short cut of set notation
  - Square brackets indicate that the endpoint is included
  - ( Round brackets indicate that the endpoint is NOT included

Ex 3. Write the following set notation in interval notation.

a)  $-3 < x \leq 1$       b)  $-2 \leq x < 5$       c)  $x \geq 0$       d)  $x < 3$

$(-3, 1]$        $[-2, 5)$        $[0, \infty)$        $(-\infty, 3)$

➤ End Behaviours

As  $x \rightarrow \infty$  state if the y-values are increasing or decreasing as x approaches positive infinity

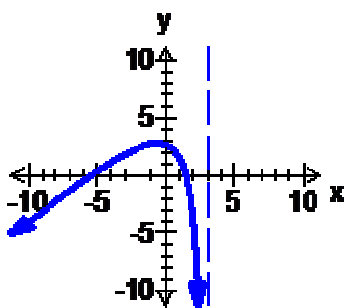
As  $x \rightarrow -\infty$  state if the y-values are increasing or decreasing as x approaches negative infinity



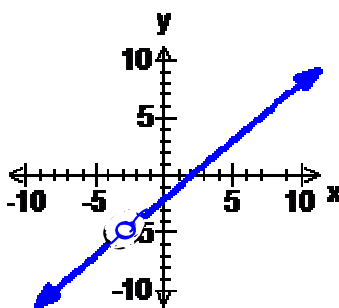
One more definition...

- Discontinuous function: function that contains at least one break in its graph.

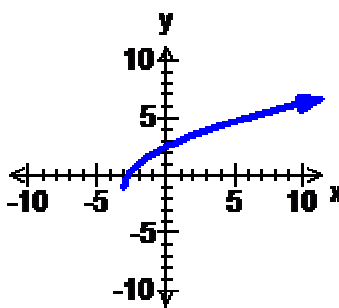
Ex 4.



★ Asymptote



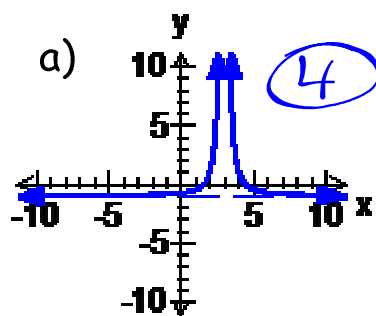
★ Hole



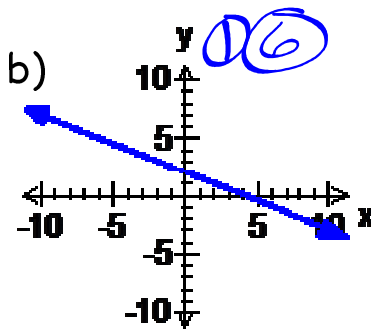
★ End Point

Each of the above functions is discontinuous.

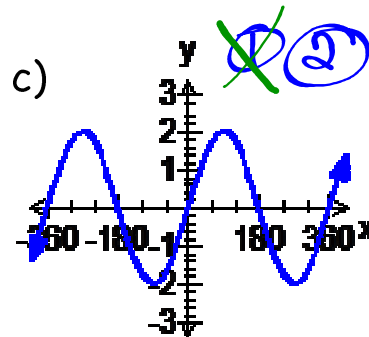
Ex 5. Match each function with a characteristic of its graph. Each number may only be used for one function.



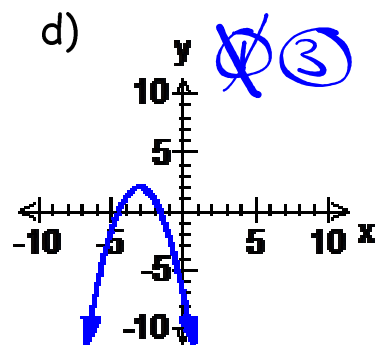
$$y = \frac{2}{(x-3)^2} - 1$$



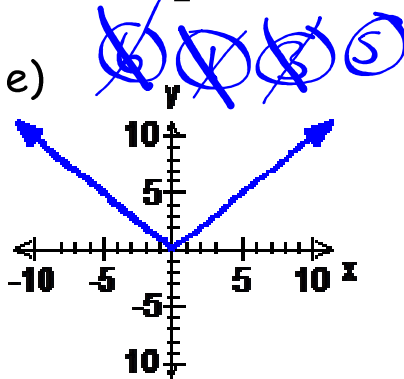
$$y = -\frac{1}{2}x + 2$$



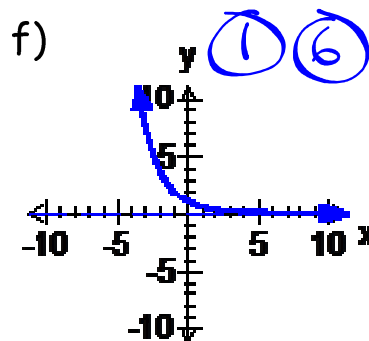
$$y = 2\sin x$$



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



$$y = |x|$$



$$y = \left(\frac{1}{2}\right)^x$$

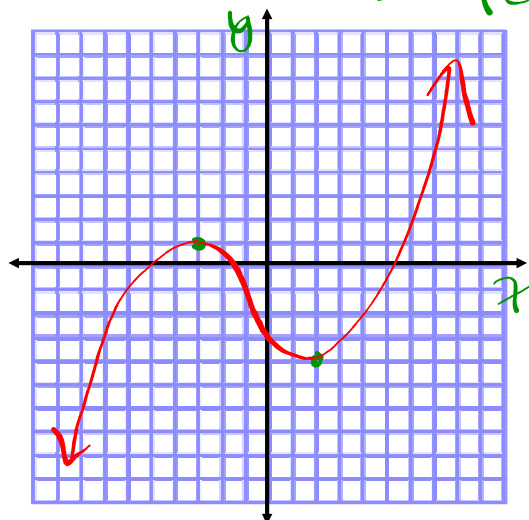
Characteristics:

1. Domain:  $\{x \in \mathbb{R}\}$
2. Infinite number of zeros
3. One turning point
4. As  $x \rightarrow \infty, y \rightarrow -1$
5. Range:  $\{y \in \mathbb{R} \mid y \geq 0\}$
6. As  $x \rightarrow -\infty, y \rightarrow \infty$

Ex 6. Sketch a possible function that has the following characteristics:

- Domain:  $\{x \in \mathbb{R}\}$
- Range:  $\{y \in \mathbb{R}\}$
- Increasing on  $(-\infty, -3)$  and  $(2, \infty)$
- Decreasing on  $(-3, 2)$
- Turning points at  $(-3, 1)$  and  $(2, -4)$

Intervals  
Points

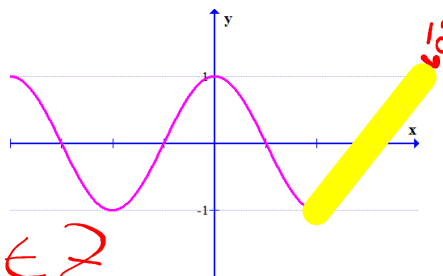


What type of function is this?

Cubic Polynomial

➤ Periodic Interval Notation

$initial\ angle + period \cdot k, k \in \mathbb{Z}$



Ex 7. State the following for  $y = \cos x$

a) zeros

$90^\circ + 180^\circ n, n \in \mathbb{Z}$

b) intervals of increase

$(180^\circ + 360^\circ n, 360^\circ + 360^\circ n), n \in \mathbb{Z}$

c) intervals of decrease

$(0^\circ + 360^\circ n, 180^\circ + 360^\circ n), n \in \mathbb{Z}$

b)  $(180, 360^\circ), (540, 720), etc \dots$

Homework:  
Page 23  
#4, 6- $\rightarrow$ 12 + Handout

Beautiful Dance Moves

