

2.3 Properties of Functions

Increasing, Decreasing, Constant Graphs; Relative Extrema

Increasing: as x increases, y increases (graph goes uphill as you move from left to right)

Decreasing: as x increases, y decreases (graph goes downhill as you move from left to right)

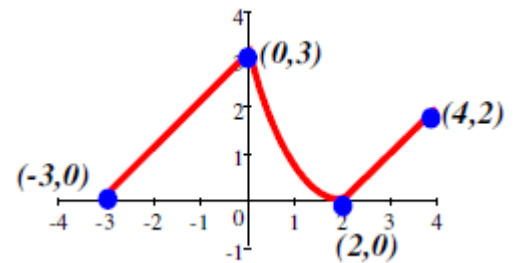
Constant: as x increases, y does not change (this part of the graph is horizontal)

Relative maximum: a point at which the graph increases and then decreases (peak)

Relative minimum: a point at which the graph decreases and then increases (valley)

EXAMPLE: Use the graph below to answer the following questions

a.) Indicate the interval(s) of which f is increasing



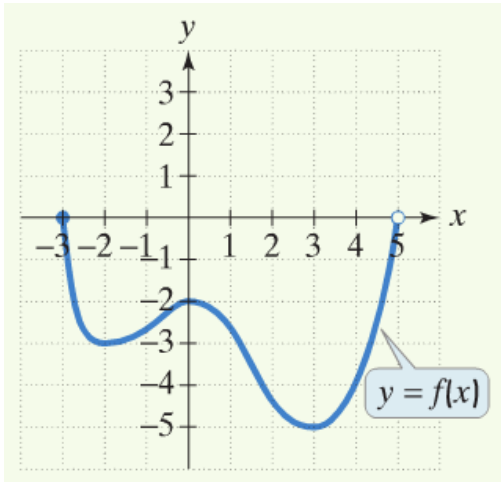
b.) Indicate the interval(s) of which f is decreasing.

c.) List the number where f has a relative maximum.

d.) What is the relative maximum?

e.) What is the relative minimum?

EXAMPLE: Use the graph below to answer the following questions



a.) Indicate the interval(s) of which f is increasing

b.) Indicate the interval(s) of which f is decreasing

c.) List the number(s) where f has a local minimum.

d.) What is the local maximum(s)?

e.) What is the local minimum(s)?

f.) What is the domain?

g.) What is the range?

Even and Odd functions

If $f(-x) = f(x)$ then the function is even, and symmetric to the y-axis.

If $f(-x) = -f(x)$ then the function is odd, and symmetric to the origin.

EXAMPLE: Determine whether the following are even, odd, or neither.

a.) $f(x) = x^4 + 7$

b.) $f(x) = 6x^5 - x^3$

c.) $f(x) = x^2 + x$

d.) $f(x) = \frac{|2x|}{x}$

e.) $f(x) = \frac{x^3}{x^2 - 9}$

Average Rate of Change (A.R.C.)

The A.R.C. is an estimate of the slope between two points.

$$\frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{f(x_2) - f(x_1)}{x_2 - x_1}$$

EXAMPLE: Find the A.R.C. for the $f(x) = -3x^2 + 3$ from $x_1 = 0$ to $x_2 = 2$.

EXAMPLE: Find the A.R.C. for the $f(x) = x^3 - x + 2$ from $x_1 = 1$ to $x_2 = 3$.

EXAMPLE: Find the A.R.C. for the $f(x) = \sqrt{x}$ from $x_1 = 9$ to $x_2 = 16$.