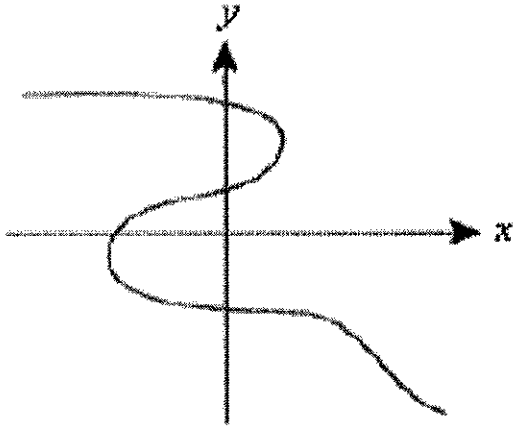# Function Basics:

A function is a rule that assigns each element in the domain (x) to exactly one element in the range (y)
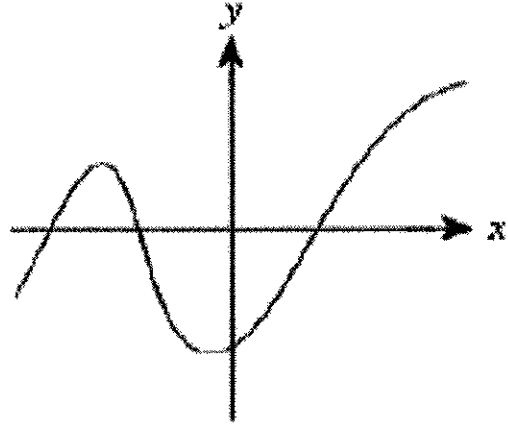
Functions as Graphs:

The vertical line test will help determine whether a graph represents y as a function of x.

State whether or not each of the following graphs represents a function.
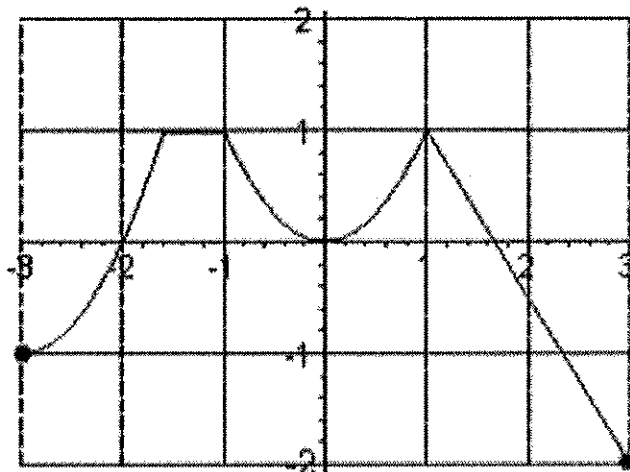
(a)

(b)

Not a function

Yes, is a function

Use the graph to evaluate the following:

a) Find the domain of f(x):

$[-3, 3]$

b) Find the range of f(x):

$[-2, 1]$

c) Evaluate f(-3)   f(-1)   f(0) and f(1)

-1 $\quad$ 1 $\quad$ 0 $\quad$ 1

d) For what value(s) of x is f(x) = -2 $x = 3$

Finding x and y intercepts:

The *x*-intercept is the value for x such that f(x) = 0

The *y*-intercept of the value for y such that f(0) = y.

Example:

Without graphing, identify the x and y intercepts for

a) $f(x) = 4 - x^2$

X intercept $4 - x^2 = 0$

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

$x = \pm 2$ $\quad$ $(2, 0)$ $\quad (-2, 0)$

y intercept $y = 4 - (0)^2$

b) $f(x) = 3x - 21$

X intercept $3x - 21 = 0$

$x = 7$ $\quad (7, 0)$

y intercept $3(0) - 21 = y$

$-21 = y$

Increasing/Decreasing Functions $\left(\underline{X} \ \text{values} \right)$

A function f is said to be <u>increasing</u> on I if functional values $f(x)$ <u>increase</u> as x increases on the interval I. In this case, the graph of f <u>rises</u> as x increases on the interval I.

A function f is said to be <u>decreasing</u> on I if functional values $f(x)$ <u>decrease</u> as x increases on the interval I. In this case, the graph of f <u>falls</u> as x increases on the interval I.
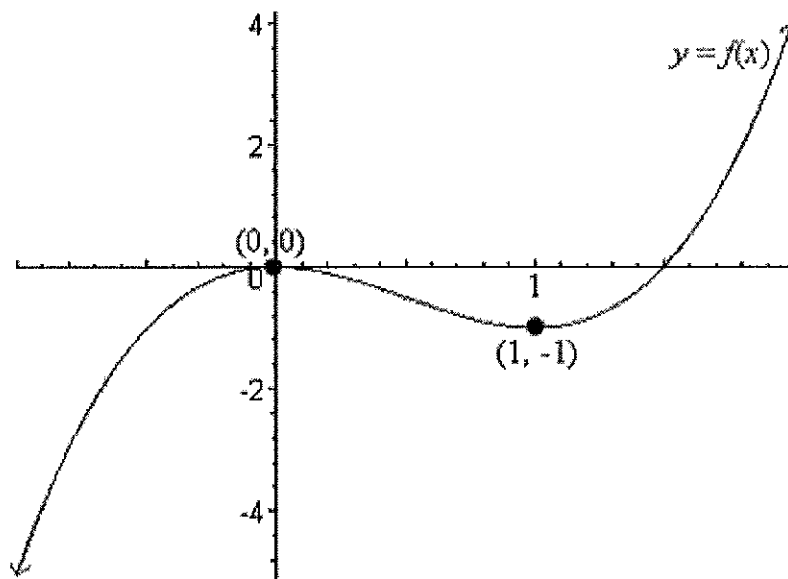
Identify the intervals that f is increasing and f is decreasing.

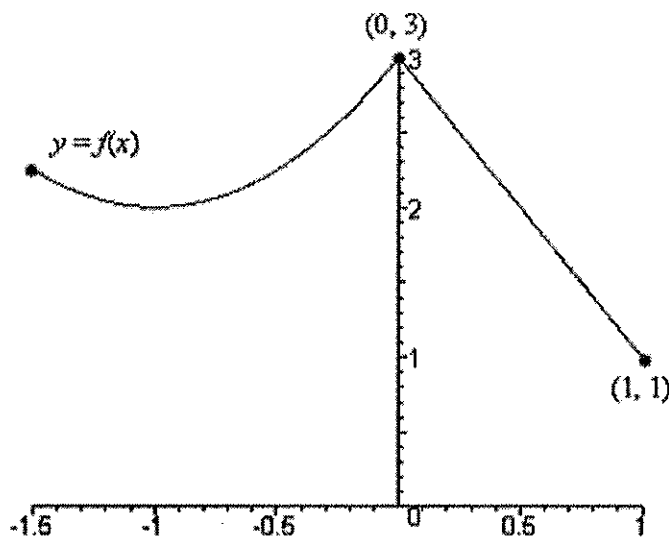**f(x) is increasing:**

$(-\infty, 0) \cup (1, \infty)$

f(x) is decreasing:

$(0, 1)$

Maximum and Minimum Values:

State the minimum and maximum of the graph below

(0, 3)

y = f(x)

(1, 1)

-1.5   -1   -0.5   0   0.5   1

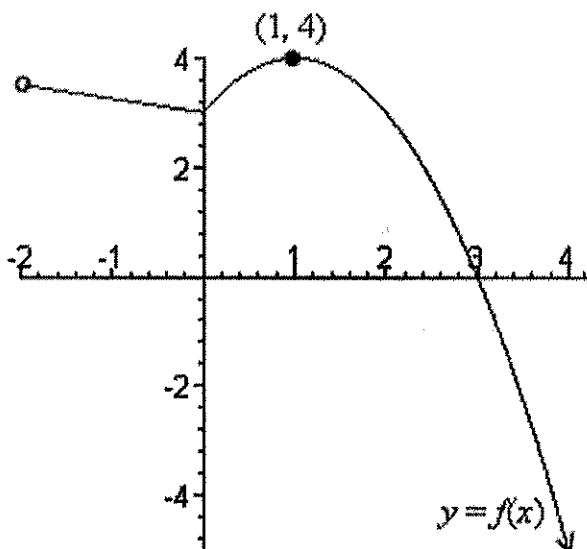Max (0, 3)
min (1, 1)

Example:

For the function f whose graph is shown above, answer the following questions.
(a) On what interval(s) is f increasing?   (b) On what interval(s) is f decreasing?
(c) Does the function have a maximum value? If so, what is the maximum value?
(d) Does the function have a minimum value? If so, what is the minimum value?

(1, 4)

4

2

-2   -1   1   2   3   4

-2

-4

y = f(x)

a) Increasing
   (0, 1)
   Decreasing
   (-2, 0) U (1, ∞)
b) Yes, (1, 4)

c) no