Basic Functions Notes

Function Basics:

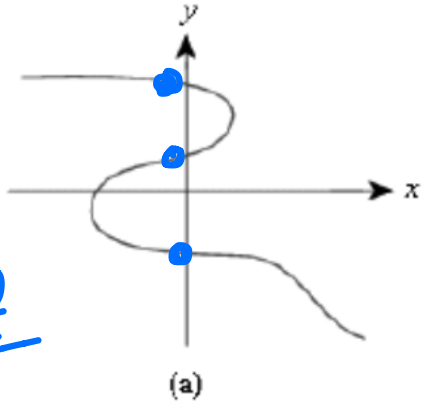
A function is a rule that assigns each element in the domain (x) to exactly one element in the range (y)

1 to 1

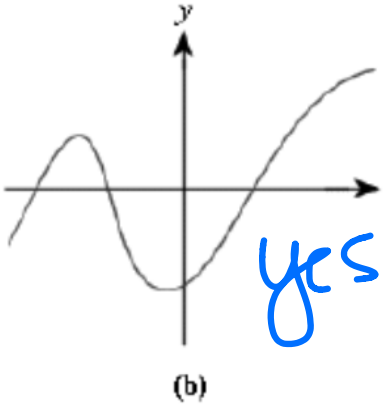
Functions as Graphs:

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)



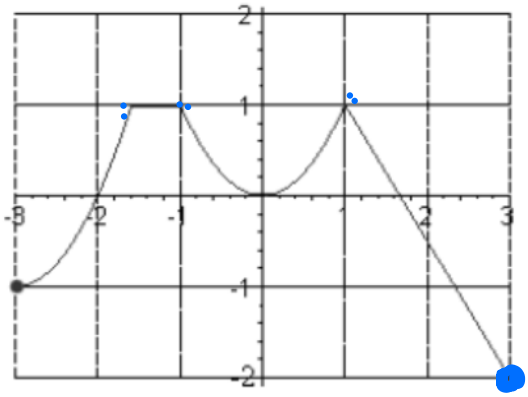
(b)

no

yes

Basic Functions Notes

Use the graph to evaluate the following:



(3, -2)

a) Find the domain of f(x):

[-3, 3]

b) Find the range of f(x):

[-2, 1]

(-3, -1)

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

"x = -3 y = ?" = -1 = 1 = 0 = 1

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

"y = -2, x = ?" 3

Finding x and y intercepts:

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

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

Plug in & Solve.

Example:

Without graphing, identify the x and y intercepts for

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

x-int

$0 = 4 - x^2$

$\sqrt{x^2} = \pm\sqrt{4}$

$x = \pm 2$

(-2, 0)

(2, 0)

y-int

$y = 4 - (0)^2$

$y = 4$

(0, 4)

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

x-int

$0 = 3x - 21$

$21 = 3x$

$7 = x$

(7, 0)

y-int

(0, -21)

Basic Functions Notes

Increasing/Decreasing Functions

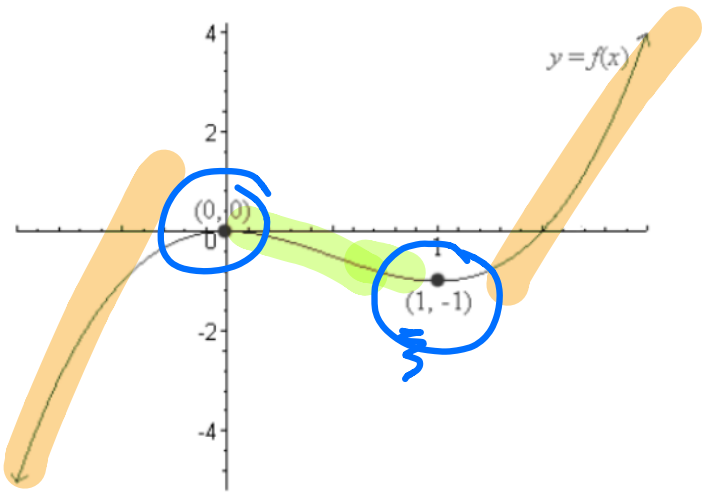
A function f is said to be increasing on I if functional values $f(x)$ increase as x increases on the interval I. In this case, the graph of f rises as x increases on the interval I.

A function f is said to be decreasing on I if functional values $f(x)$ decrease as x increases on the interval I. In this case, the graph of f falls 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: $(0, 1)$

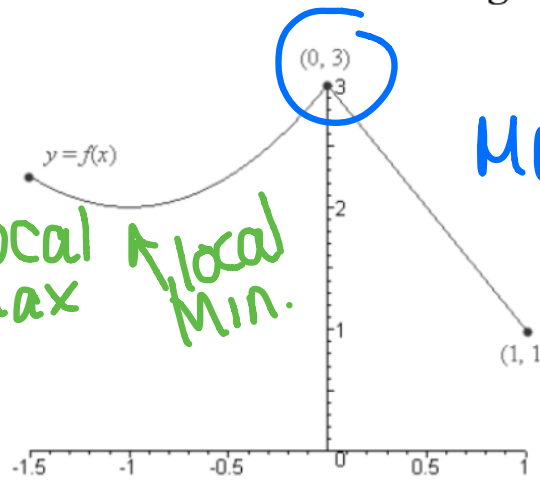


Describe when use the x-values of the functions use interval notation only use ( ) ∪

Basic Functions Notes

Maximum and Minimum Values:

State the minimum and maximum of the graph below



1. Relative/Local
2. Absolute

local max

local min.

Max (0, 3)

Min (1, 1)

(x, y) "When" value of max/min

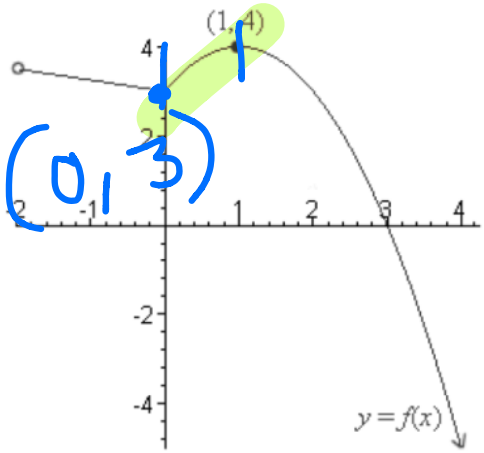
Example:

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?



(0, 3)

a. (0, 1)

b. $(-2, 0) \cup (1, \infty)$

c. (1, 4)

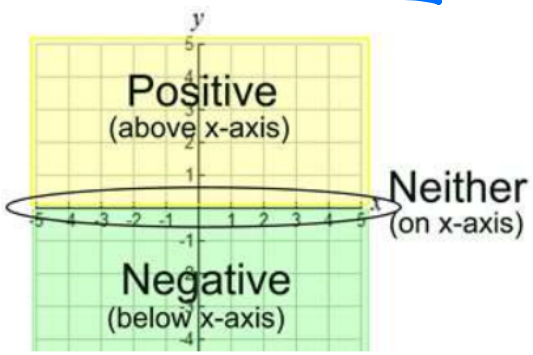
d. no absolute min.

Basic Functions Notes

Positive / Negative

A function f is called **positive** on an interval I if $f(x) > 0$ for all x in I.

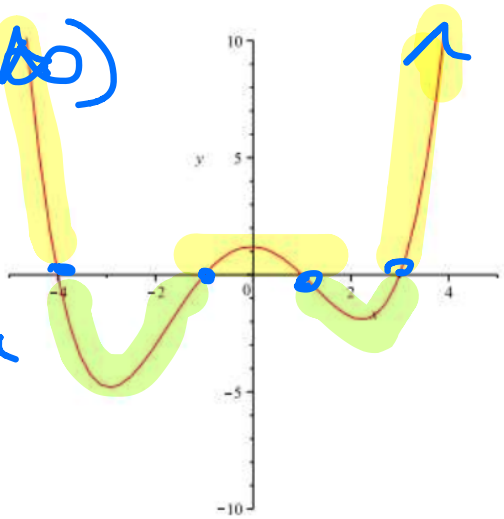
A function f is called **negative** on an interval I if $f(x) < 0$ for all x in I.



Example:

Where is the $f(x) > 0$?

$(-\infty, -4) \cup (-1, 1) \cup (3, \infty)$

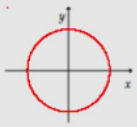


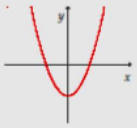
Where is the $f(x) < 0$?

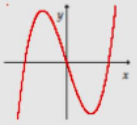
$(-4, -1) \cup (1, 3)$

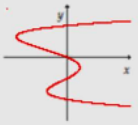
Basic Functions Practice

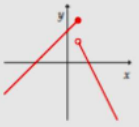
Determine whether each of the graphs represents a function.

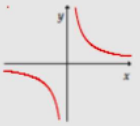
1. 

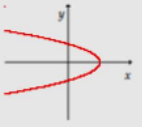
2. 

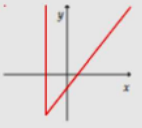
3. 

4. 

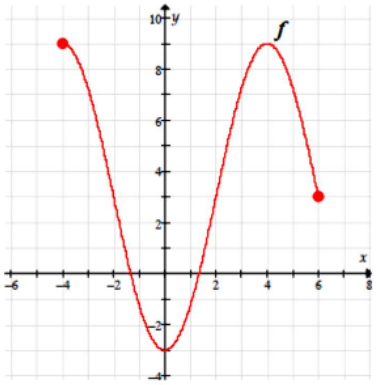
5. 

6. 

7. 

8. 

15. The graph of $y = f(x)$ is shown below.



(a) Find the domain of the function. Write your answer in interval notation.

(b) Find the range of the function. Write your answer in interval notation.

(c) Find the y-intercept(s) of the function.

(d) Find the following function values:
$f(-2)$; $f(0)$; $f(4)$; $f(6)$

(e) For what value(s) of x is $f(x) = 9$?

(f) On what interval(s) is f increasing?

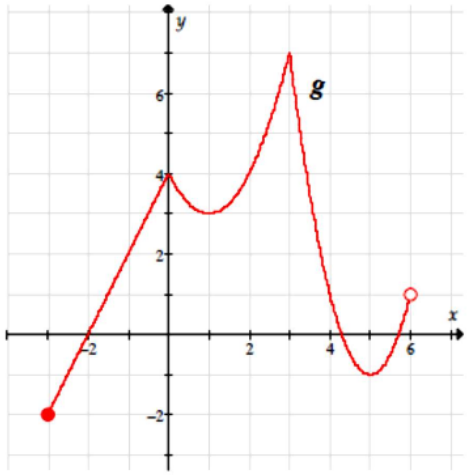
(g) On what interval(s) is f decreasing?

(h) What is the maximum value of the function?

(i) What is the minimum value of the function?

Basic Functions Practice

16. The graph of $y = g(x)$ is shown below.



(a) Find the domain of the function. Write your answer in interval notation.

(b) Find the range of the function. Write your answer in interval notation.

(c) Find the y-intercept(s) of the function.

(d) Find the following function values:
$g(-2)$; $g(0)$; $g(1)$; $g(3)$; $g(6)$

(e) For what value(s) of x is $g(x) = -2$?

(f) On what interval(s) is g increasing?

(g) On what interval(s) is g decreasing?

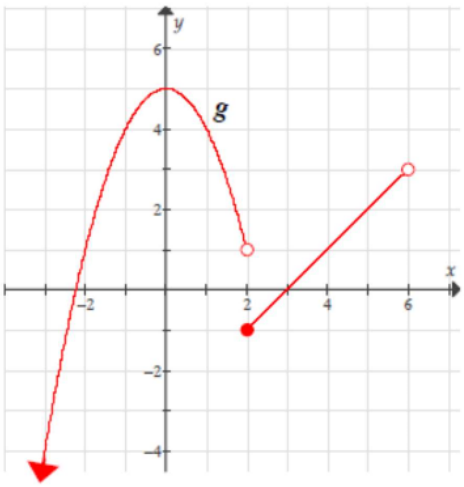
(h) What is the maximum value of the function?

(i) What is the minimum value of the function?

(j) On what interval is the graph positive? Negative?

Basic Functions Practice

17. The graph of $y = g(x)$ is shown below.



(a) Find the domain of the function. Write your answer in interval notation.

(b) Find the range of the function. Write your answer in interval notation.

(c) How many x-intercept(s) does the function have?

(d) Find the following function values:
$g(-2)$; $g(0)$; $g(2)$; $g(4)$; $g(6)$

(e) Which is greater, $g(-2)$ or $g(3)$?

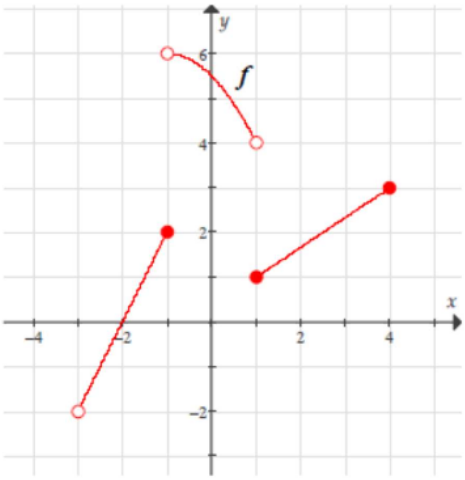
(f) On what interval(s) is g increasing?

(g) On what interval(s) is g decreasing?

(h) On what interval is the graph positive? Negative?

Basic Functions Practice

18. The graph of $y = f(x)$ is shown below.



(a) Find the domain of the function. Write your answer in interval notation.

(b) Find the range of the function. Write your answer in interval notation.

(c) Find the x-intercept(s) of the function.

(d) Find the following function values:
$f(-3)$; $f(-2)$; $f(-1)$; $f(1)$; $f(4)$

(e) Which is smaller, $f(0)$ or $f(3)$?

(f) On what interval(s) is f increasing?

(g) On what interval(s) is f decreasing?

(h) On what interval is the graph positive? Negative?