Chapter 2

Functions and Their Graphs

Section 3
Properties of Functions

Even and Odd Functions

A function is **even** if, for every number x in its domain, the number –x is also in the domain and f(-x) = f(x)

A function is **odd** if, for every number x in its domain, the number –x is also in the domain and f(-x) = -f(x)

Graphs of Even and Odd Functions:

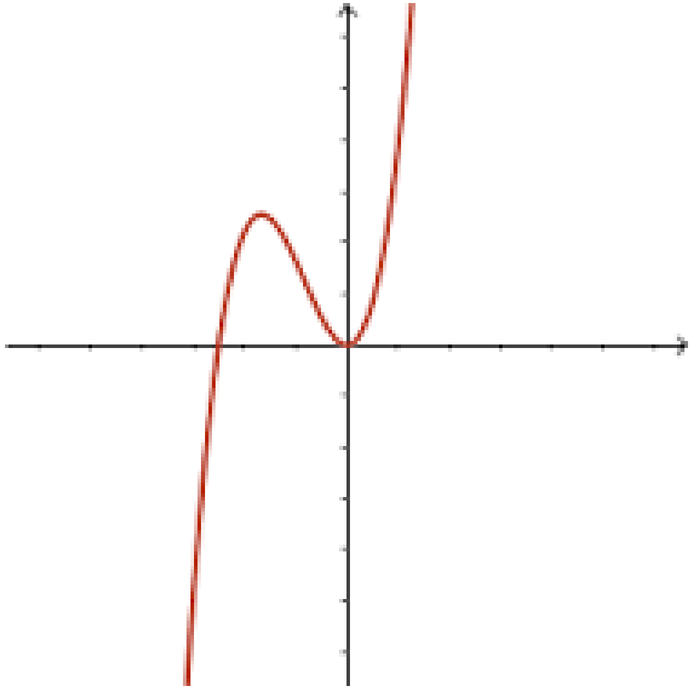
Even – if the graph has symmetry with respect to the y-axis

Odd – if the graph has symmetry with respect to the origin

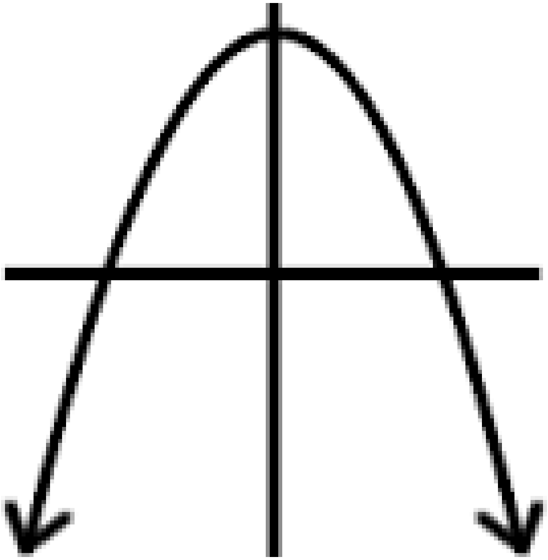
Example 1:

Determine whether each graph is even, odd or neither.

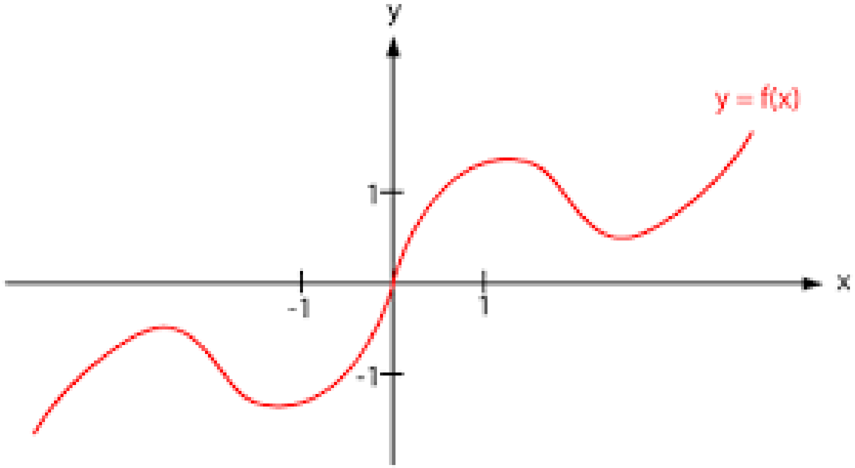
↳y-axis ↳origin



Neither



Even



Odd

Example 2:

Identify if the function if even, odd or neither.

Start w/ plugging in (-x); if that doesn't work make entire function negative

a) $f(x) = x^2 - 5$

even:

$(-x)^2 - 5$

$x^2 - 5$

even ✓

b) $g(x) = x^3 - 1$

even:

$(-x)^3 - 1$

→ $-x^3 - 1$

even X

odd:

$-(x^3 - 1)$

→ $-x^3 + 1$

odd X

NEITHER

c) $h(x) = 5x^3 - x$

even:

$5(-x)^3 - (-x)$

→ $-5x^3 + x$

even X

odd:

$-(5x^3 - x)$

→ $-5x^3 + x$

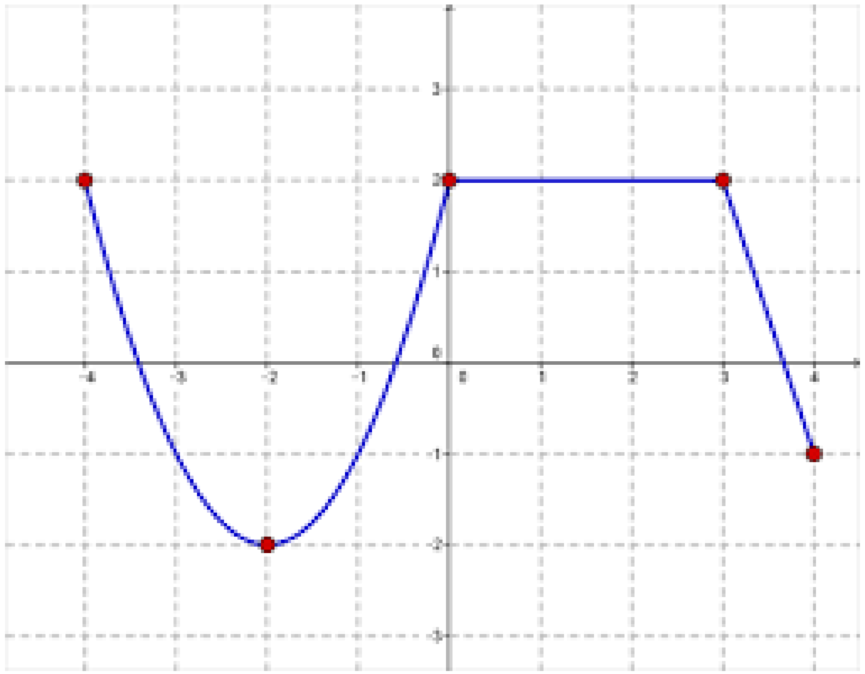
odd ✓

even must match original; odd must match even test

A function f is increasing on an open interval I if, for any choice of x_1 and x_2 in I, with $x_1 < x_2$, we have $f(x_1) < f(x_2)$

A function f is decreasing on an open interval I if, for any choice of x_1 and x_2 in I, with $x_1 < x_2$, we have $f(x_1) > f(x_2)$

A function f is constant on an open interval I if, for all choices of x in I, the values f(x) are equal



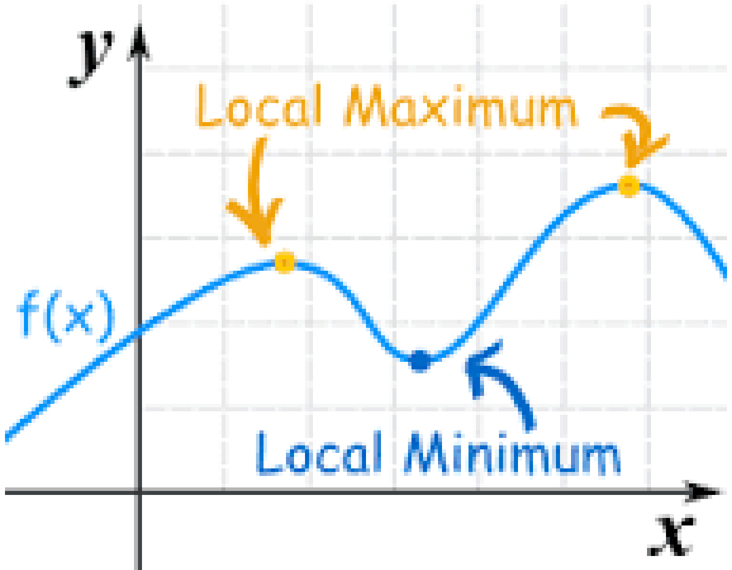
Local Maxima and Local Minima

A function f has a local maximum at c if there is an open interval I containing c so that, for all x not equal to c in I, f(x) < f(c). We call f(c) a local maximum of f

(the graph changes from increasing to decreasing)

A function f has a local minimum at c if there is an open interval I containing c so that, for all x not equal to c in I, f(x) > f(c). We call f(c) a local minimum of f

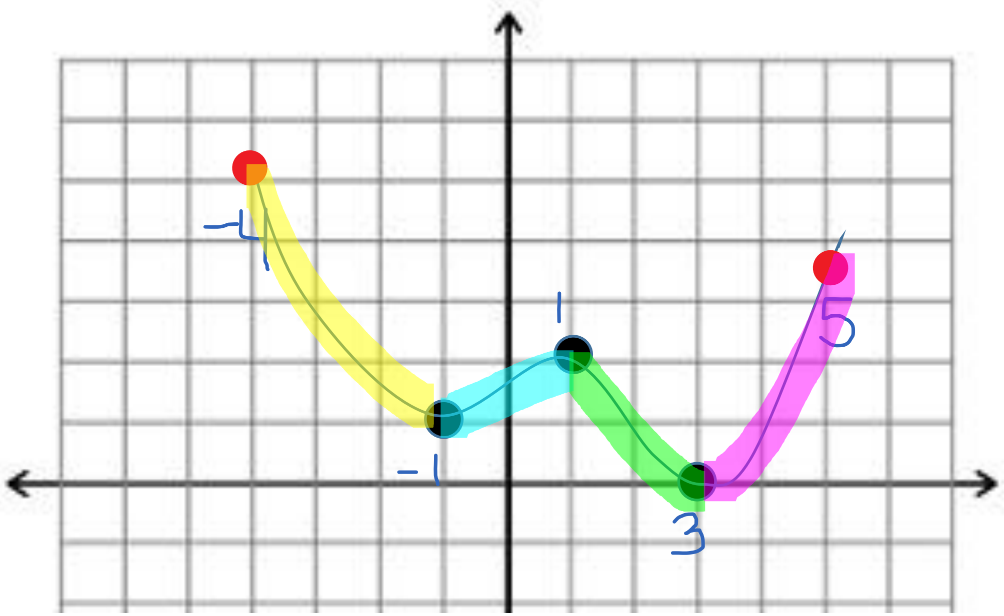
(the graph changes from decreasing to increasing)



Example 4:

At what value(s) of x does f have a local maximum?

1



What are the maximums?

(1, 2) OR f(1) = 2

At what value(s) of x does f have a local minimum?

-1 and 3

What are the minimums?

(-1, 1) and (3, 0)

f(-1) = 1 f(3) = 0

use x-values

Intervals where I/D/C:

D: $-4 \le x \le -1$

I: $-1 \le x \le 1$

D: $1 \le x \le 3$

I: $3 \le x \le 5$

Using a Calculator to Determine Local Maximums and Minimums

Find the local max and min for

$f(x) = 6x^3 - 12x + 5$ for $-2 < x < 2$

(don't forget to change your window!!)

Local max:

2nd → TRACE → Maximum → Left?, Right?, Guess?

Local min:

2nd → TRACE → Minimum → Left?, Right?, Guess?

Where is it increasing and decreasing??

Average Rate of Change from a → b [or c → x]

$$\frac{\Delta y}{\Delta x} = \frac{f(b)-f(a)}{b-a} \quad \text{or} \quad \frac{\Delta y}{\Delta x} = \frac{f(x)-f(c)}{x-c}$$

Same concept as slope where a and b [x and c] are the x values of the ordered pair, and you have to find the y values by plugging the x's into f(x)

Example 6:

Find the average rate of change of $f(x) = 3x^2$ from:

a) 1 to 3

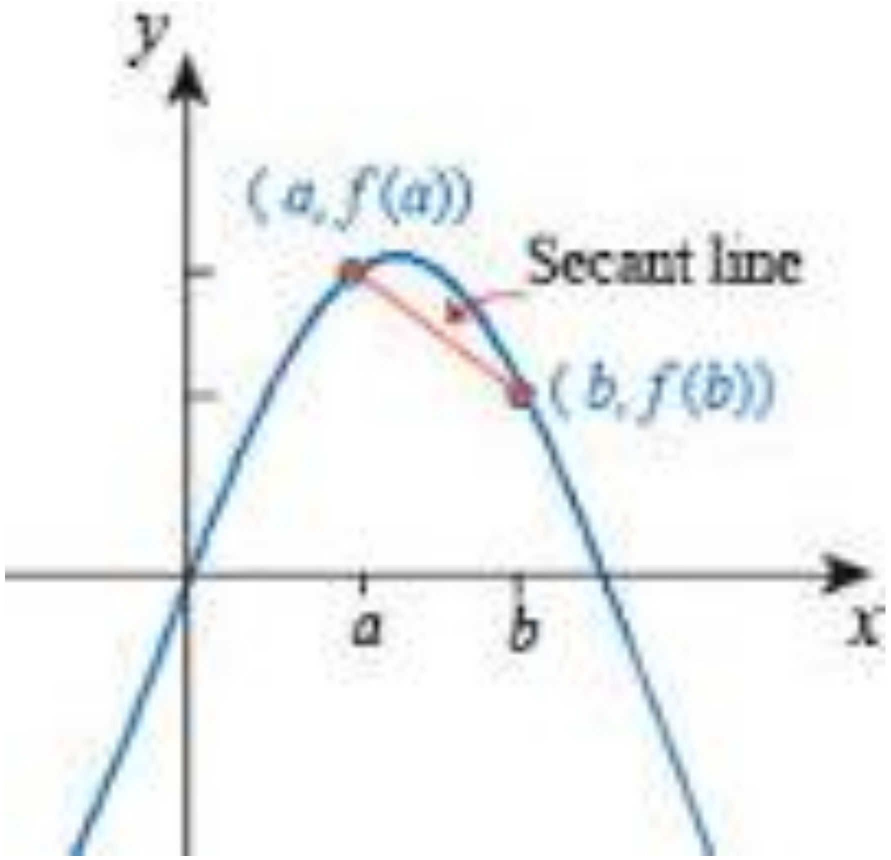
b) 1 to 5

c) 1 to 7

Slope of the Secant Line

The average rate of change of a function from a to b equals the slope of the secant line containing two points (a, f(a)) and (b, f(b)) on its graph.

$$\frac{f(b)-f(a)}{b-a}$$



????

#s 11-19 odd, 21, 35, 53, 57 (if there is time)

EXIT SLIP