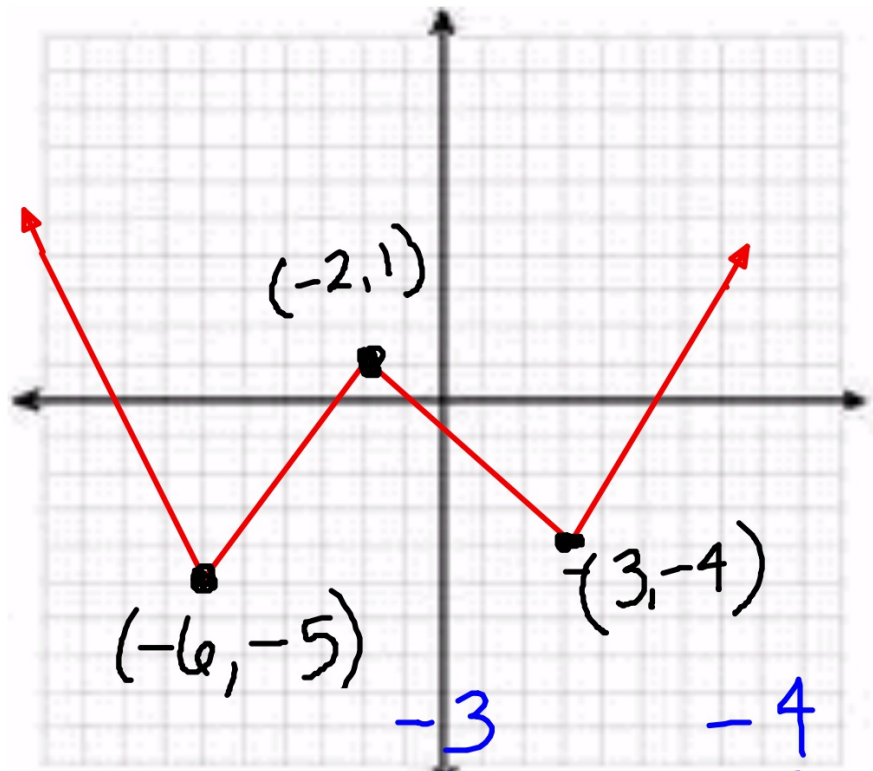


Sec 2.2.2
Maxima & Minima
Even & Odd Functions

Relative Maxima and Minima- points at which a function changes from increasing to decreasing or decreasing to increasing...NOT involving a constant interval.

Also called local max/mins...

List any local maxima and minima:



A local/relative minima occurs at $x = -6$ and it is ... -5

A local/relative maxima occurs at $x = -2$ and it is... 1

Determine if a function is even or odd
...given a function
....given a graph

To determine if a function is EVEN-

Given a function-

1. Substitute $-x$ for all x .
2. "Clean up"/simplify

If the function remains the same, it is even.

Show that $f(x) = x^4 - 2x^2$ is an even function.

$$\begin{aligned} &= (-x)^4 - 2(-x)^2 \\ &= x^4 - 2x^2 \end{aligned}$$

The result is the same $f(x)$, therefore the function is even.

To determine if a function is ODD-

Given a function

1. substitute $-f(x)$ for $f(x)$ and $-x$ for x

* Let $y = f(x)$take the opposite of both

2. "Clean up"/simplify.

If the function remains the same, it is an odd function.

Show that $f(x) = x^3 - 6x$ is an odd function.

$$\begin{aligned}y &= x^3 - 6x \\-y &= (-x)^3 - 6(-x) \\-y &= -x^3 + 6x \\-y &= -(x^3 - 6x) \\y &= x^3 - 6x = f(x)\end{aligned}$$

Determine if $f(x) = x^2 + 2x + 1$ is even, odd or neither.

even $\rightarrow y = (-x)^2 + 2(-x) + 1$

$y = x^2 - 2x + 1 \rightarrow$ not same
not even

odd $\rightarrow -y = (-x)^2 + 2(-x) + 1$

$-y = x^2 - 2x + 1$

NEITHER

not same
not odd

Determine if $g(x) = 7x^3 - x$ is even, odd or neither.

even $\rightarrow y = 7(-x)^3 - -x$

$$y = -7x^3 + x \quad \text{not even}$$

odd $\rightarrow -y = 7(-x)^3 - -x$

$$-y = -7x^3 + x$$

$$-y = -(7x^3 - x)$$

$$y = 7x^3 - x$$

SAME
IS ODD

Determining given a graph...

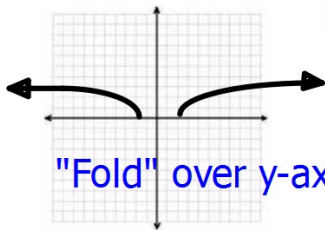
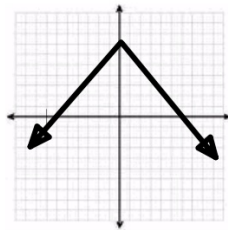
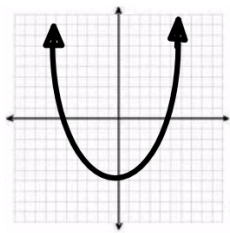
If a graph is symmetric with respect to the y -axis it is the graph of an even function.

This also means, if (x,y) is on a graph, then $(-x,y)$ is also on the graph

If a graph is symmetric with respect to the origin, it is the graph of an odd function.

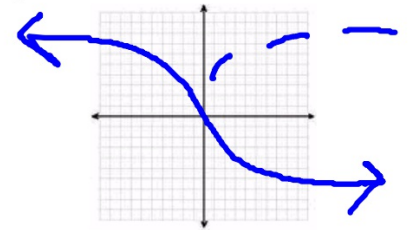
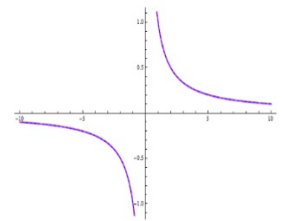
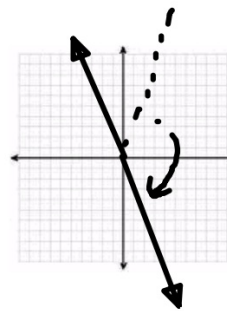
This also means, if (x,y) is on a graph, then $(-x,-y)$ is also on the graph.

Graphs of even functions



"Fold" over y-axis, mirror image

Graphs of odd function



Fold over both axes, same image

Suggested Practice

Sec 2,2
page 238-239
13,14
17-35 odds

13. a. $0, f(0)=4$

b. $-3, 3$

$$f(-3)=f(3)=0$$

14. a. $0, f(0)=2$

b. $-3, 3$ $f(-3)=f(3)=-1$

17. odd

19. neither

21. even

23. even

25. even

27. odd

29. even

31. odd

33. a. $(-\infty, \infty)$

b. $[-4, \infty)$

c. $1 \leq 7$ f. $(0, 4)$

d. 4 g. $(-\infty, 0)$

e. $(4, \infty)$

33. h. 4

i. -4

j. 4

k. $2 \notin 6$

l. neither

35.

a. $(-\infty, 3]$

b. $(-\infty, 4]$

c. ± 3

d. 3

e. $(-\infty, 1)$

f. $(1, 3)$

g.

$(-\infty, -3]$

h. max
of 4
occurs

@ 1

i. 1
j. positive

