

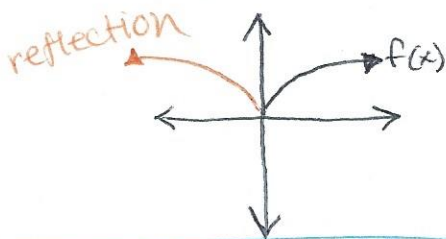
Symmetry of a graph/function

Deisy G. Math 2311
Ms. Palmer
Tue 2/12/19

- Symmetric about the y-axis

[ex] from a graph

$$f(x) = \sqrt{x}$$



* If a function is symmetric about the y-axis, then it's an even function.

from an equation

$$\text{Test: } F(x) = F(-x)$$

[ex] $F(x) = x^2 - 2x + 4$

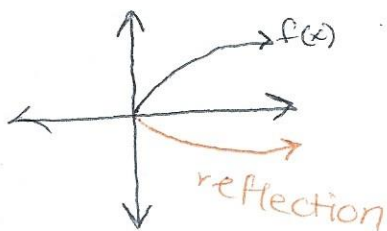
$$F(-x) = (-x)^2 - 2(-x) + 4 \\ = x^2 + 2x + 4$$

$$F(x) \neq F(-x)$$

$F(x)$ is not symmetric over/about the y-axis because of the test

- Symmetric about the x-axis

[ex] from a graph



From an Equation

$$\text{Test: } f(x) = -f(x)$$

[ex] $x^2 + y^2 = 7 \rightarrow f(x)$

$$-f(x) = x^2 - y^2 = 7 \\ = x^2 + y^2 = 7$$

$$f(x) = -f(x)$$

Then it's symmetric about the x-axis.

- Symmetric about the origin

From an equation:

$$\text{Test: } f(-x) = -F(x)$$

[ex] $f(x) = x^3$

$$f(-x) = (-x)^3 = -x^3$$

$$-F(x) = -x^3$$

$$f(-x) = -F(x)$$

This function is symmetric about the origin

* If a function is symmetric about the origin then it's odd.

Ex) Determine if the following function is even, odd, or neither.

Deisy G. Pg 2
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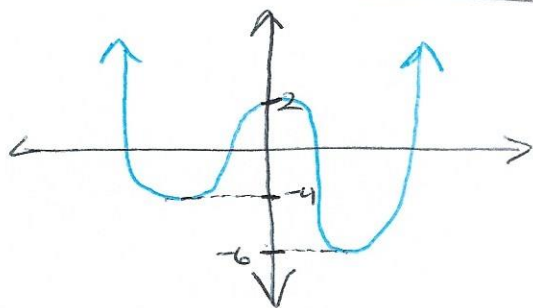
odd $f(-x) = -f(x)$
even $f(x) = f(-x)$

$$f(x) = x^3 - 2x^2 + 5$$

$$f(-x) = (-x)^3 - 2(-x)^2 + 5 = -x^3 - 2x^2 + 5$$

$$-f(x) = -(x^3 - 2x^2 + 5) = -x^3 + 2x^2 - 5$$

neither



Global Max | highest overall: ∞

local Max | $y=2$

local Min | $y=-6$

Global Min | $y=-6$