PreCalculus Name: Period: Date:

Warm Up 9/11

Lesson 2-4: Transformation of Functions II

Objective

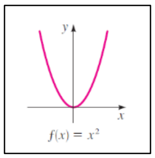
Students will…

- Be able to apply the properties of reflections in graphing various functions.
- Be able to determine whether a function is even or odd.

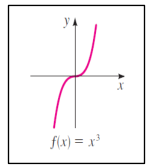
"Parent" Functions

We have seen and studied some of the standard functions and their graphs. For example.

$f(x) = x^2$



$f(x) = x^3$



Transformation of Functions

Let's go ahead and compare the two functions: $f(x) = x^2$ and $g(x) = -x^2$

Now let's compare the functions: $f(x) = \sqrt{x}$ and $g(x) = \sqrt{-x}$

Transformation: Reflection

As observed, the differences between the two functions were either ____________________________ reflection.

This can be generalized by the following:

Along the y-axis (horizontal)

$y = f(-x)$ reflects the graph of $y = f(x)$ along the ___axis (______________________ reflection).

Along the x-axis (vertical)

$y = -f(x)$ reflects the graph of $y = f(x)$ along the ___axis (_______________ reflection).

Examples

Sketch the following functions by transforming its "parent" function.

a. $f(x) = -|x|$

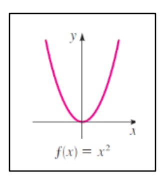
b. $f(x) = (-x)^3$

Even Functions

Consider the function $f(x) = x^2$. We observed that it can be reflected vertically, i.e. along the x-axis. What happens when we try to reflect this function horizontally, i.e. along the y-axis?

This would mean that the equation would be written in the form of $f(x) = (-x)^2 = x^2$

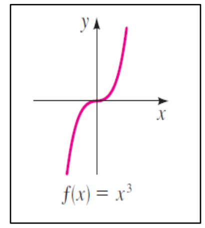
So, as you can see horizontal reflection really did not change anything. This can easily be seen on its graph.



Any function that has this characteristic is called an ____________ function.

Odd Functions

Now consider the function $f(x) = x^3$. We have already seen it reflected horizontally, i.e. along the y-axis. What happens when we reflect this graph vertically, i.e. along the x-axis? Look at the graph! Here the graph looks the same whether it is reflected vertically or horizontally.
This can easily be seen algebraically: $(-x)^3 = -x^3$.
Any function that has this characteristic is called an ________ function.



Even and Odd Functions

So now we give a formal, generalized definition of even and odd functions:
Let f be a function,

f is even if $f(-x) =$, for all x in the domain of f
f is odd if $f(-x) =$, for all x in the domain of f

Ex. Determine whether the following functions are even or odd.

a. $f(x) = x^5 + x$ b. $g(x) = 1 - x^4$ c. $h(x) = 2x - x^2$

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