Name: ______________________________ Date: _____________________ **Unit 3 Class Work**

Even and Odd Polynomial Functions Class Work

Objective: *You will be able to identify & prove even and odd polynomial functions.*

Consider a given function f(x), as well as the reflections f(-x) and -f(x).

If one pair of the functions are equal, then f(x) is even.

Hypothesize: Which pair do you think would have to be equal for the function to be even? Why? Hint: Consider the graph of the functions.

★ <u>Even functions:</u>

- A function is considered even when

*In other words, the graph of an even function is

- Prove that x^2 - 4 is even.

What comes to mind when you think of the word "even?" What about "odd?"

• divisible by 2
• the same on both sides
• equal among parts

• Not equally divisible by 2
• Not exactly equal

What qualities do you think something that is even has? What about something that is odd?

• equal/the same

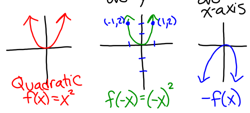
What qualities do you think even functions will have? What about odd functions?

f(x) · original

f(-x) · input negative · reflect over y-axis

-f(x) · output negative · reflects over x-axis

ex



Quadratic $f(x)=x^2$

$f(-x)=(-x)^2$
$=-x\cdot -x$
$=x^2$

$-f(x)$

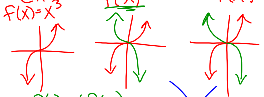
ex
$f(1)=2$ $f(-1)=2$
$f(1)=f(-1)$

*Even:
- same on left/right
- reflection over y-axis does Not change the graph
- $f(x)=f(-x)$

ex. $f(x)=x^3$

f(-x)

-f(x)



$f(x)\neq f(-x)$
Not even

$f(-x)=-f(x)$
→ odd
* looks same upside down

Nov 2-8:13 AM

What comes to mind when you think of the word "even?" What about "odd?"

even
- divisible by 2
- orderly
- split in half
- same on both "sides"

Odd
- "weird"
- Not divisible by 2

What qualities do you think something that is even has? What about something that is odd?

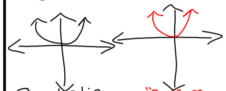
OR a function

What qualities do you think even functions will have? What about odd functions?

$f(x)$ original

$f(-x)$ reflection over y-axis

$-f(x)$ reflection over x-axis



Quadratic $f(x)=x^2$

"Same on both sides"

$f(-x)=(-x)^2$
$=-x\cdot-x$
$=x^2$

* $f(x)=x^2$
$f(-x)=x^2$

$\boxed{f(x)=f(-x)}$

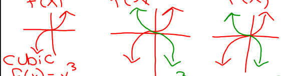
Even

$\boxed{\text{Symmetric about y-axis}}$

ex. 2 $f(x)$

$f(-x)$

$-f(x)$



cubic $f(x)=x^3$

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

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

Odd

b/c $\boxed{f(-x)=-f(x)}$

$\boxed{\text{reflection over y-axis is the same as over x-axis}}$

Nov 2-8:13 AM

What comes to mind when you think of the word "even?" What about "odd?"

What qualities do you think something that is even has? What about something that is odd?

What qualities do you think even functions will have? What about odd functions?

Nov 2-8:13 AM

Consider a given function f(x), as well as the reflections f(-x) and -f(x).

If one pair of the functions are equal, then f(x) is even.

Hypothesize: Which pair do you think would have to be equal for the function to be even? Why? Hint: Consider the graph of the functions.

★ Odd functions:

- A function is considered odd when

*In other words, the graph of an odd function is

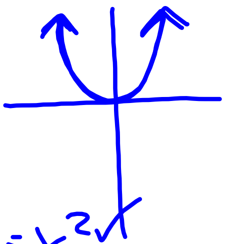
- Prove that x^3 - x is odd.

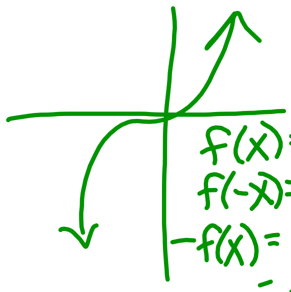
★ Note that some functions are neither odd nor even!

Practice!

In your notebook...

	EVEN	**ODD**
Visually	symmetric about y-axis	symmetric about origin
Algebraically	$f(x)=f(-x)$	refl. over x-axis is same as refl. y-axis $-f(x)=f(-x)$
Example	$f(x)=x^2$ $f(-x)=(-x)^2$ $=-x\cdot -x=x^2$ ✓	$f(x)=x^3$ $f(-x)=-x^3$ $-f(x)=-(x^3)$ $=-x^3$





Name: ______________________ Date: ______________________ Un

1. Identify each function as even, odd, or neither. Justify your answers comple

a. $r(x) = (x+1)^2 = (x+1)(x+1) = \underline{x^2+2x+1}$

$r(-x) = (-x+1)(-x+1) = \underline{x^2-2x+1}$ not even

$-r(x) = -(x+1)^2$

$= -(x^2+2x+1)$

$= \underline{-x^2-2x-1}$ Not odd

Neither

b. $t(x) = \underline{x^3 + 2x}$

$t(-x) = (-x)^3 + 2(-x)$

$= \underline{-x^3-2x}$ Not even

$-t(x) = -(x^3+2x)$

$= \underline{-x^3-2x}$

Odd b/c $t(-x) = -t(x)$

c. $g(x) = x^5 - 3x^3 + 4x^2$

$g(-x) = (-x)^5 - 3(-x)^3 + 4(-x)^2$

$= \underline{-x^5+3x^3+4x^2}$ NOT even

$-g(x) = -(x^5-3x^3+4x^2)$

$= \underline{-x^5+3x^3-4x^2}$ NOT odd

$4(-x)^2$

$4(-x)(-x)$

$4x^2$

neither

d. ~~m(x)~~ [illegible]

d. $f(x) = \underline{2x^4 - 3x^2}$

$f(-x) = 2(-x)^4 - \underline{3(-x)^2}$

$= \underline{2x^4 - 3x^2}$

EVEN b/c $f(x) = f(-x)$

$3(-x)(-x)$

$3x^2$

e. $n(x) = x^6 - 2x^2 - x$

[illegible]

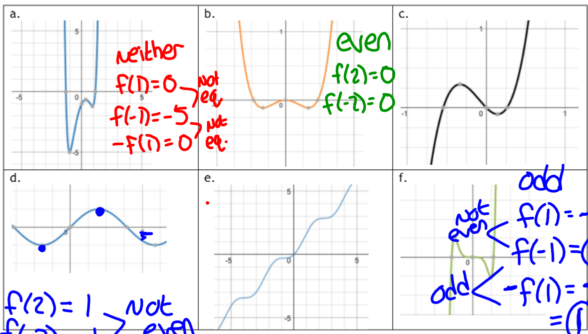
$w(x) = x^7 - 3x^3 + x$

Create any even function & prove that it is even.

Name: ______________________________ Date: ____________________ **Unit 3 Class Work**

Practice Identifying Even vs. Odd Provided With the Graphs of Functions:

Identify each function as even, odd, or neither. Justify your choice in detail, and be sure to mention an example or counter-example to support each each.



a. neither
$f(1)=0$ not eq
$f(-1)=-5$ not eq.
$-f(1)=0$

b. even
$f(2)=0$
$f(-2)=0$

d. $f(2)=1$ not even
$f(-2)=-1$
$-f(2)=-1$ odd

f. odd
$f(1)=-1$ not even
$f(-1)=1$
$-f(1)=-(-1)=1$ odd

<u>*Complete the following OUT OF ORDER*</u>. ☺

★ Create a function equation or a graph for an even function.

★ Create a function equation or a graph for an odd function.

★ Create a function equation or a graph for a function that is neither even nor odd.

*Switch with a partner, and determine the evenness or oddness of their functions!