Name: Key Per: _____ Date: _____

Serafino • Algebra 2E

6D Even / Odd Functions

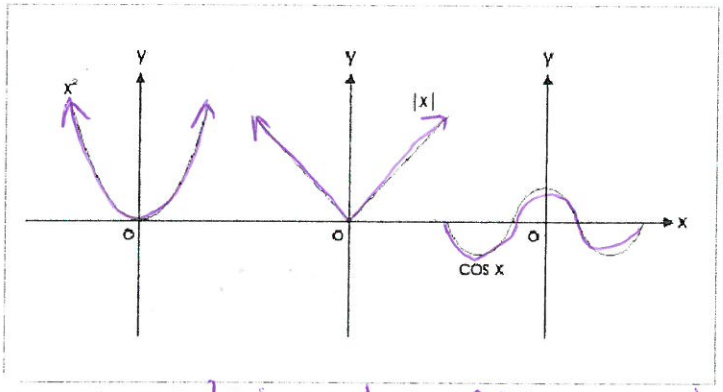
Class Activity

A new way to classify functions: In the world of functions, we can classify functions by degree (linear, quadratic, radical, etc) and number of terms (monomial, trinomial, etc). There are other classifications out there that can apply to ANY function or relation. Functions are either **EVEN, ODD or NEITHER.**

EVEN Functions

Visually: Y–axis is the axis of symmetry
Reflection over the y–axis (x = 0)

Algebraically: **f(–x) = f(x)**

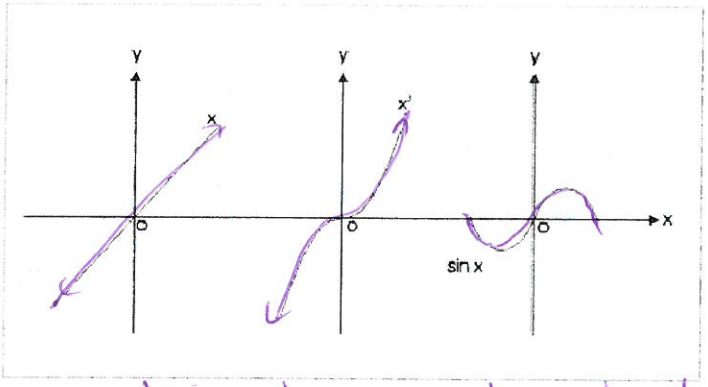


opposite input → SAME output

ODD Functions

Visually: 180° rotational symmetry about the origin
Double reflection over y–axis AND x–axis

Algebraically: **f(–x) = – f(x) = – f(–x)**

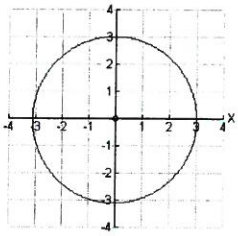


opposite input → opposite output

A FUNCTION can be even, odd, or neither. Most parent functions will be either even or odd. See above.
A few parent functions are neither. We've done of those already.

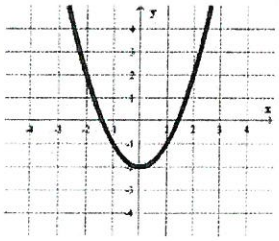
like $\sqrt{x}$!

A RELATION (equations that are not functions) can be even, odd, neither or can be both.
A good example of this is a circle: $x^2 + y^2 = 9$ →

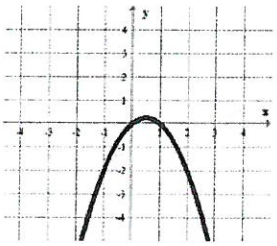


In your math travels, you will be asked to verify if a function is even or odd, or neither.
You can do this visually, from a graph, or algebraically, from evaluation. Both are easy.

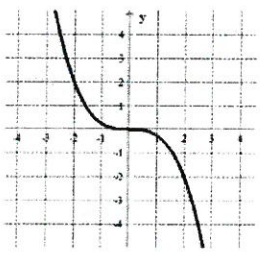
Determining Even/Oddness from a Graph:
Check for y–axis symmetry or if it's a 180 ° spin around the origin (double reflection)



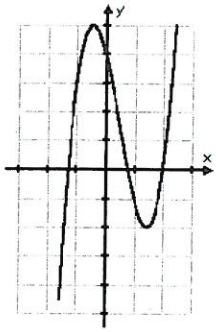
A: even



B: neither



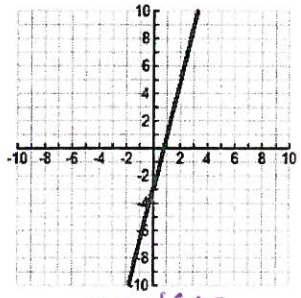
C: odd



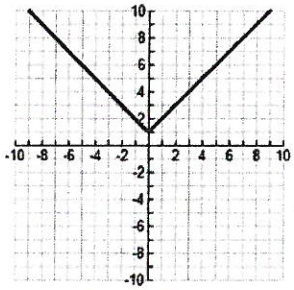
D: neither

Now you try!

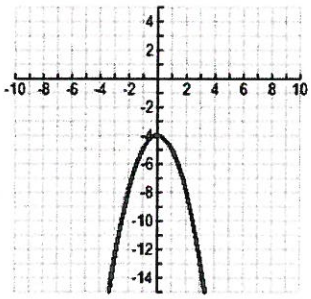
1. **Evenness/Oddness from a Graph:** Determine if the following graphs are of functions that are even, odd, or neither.



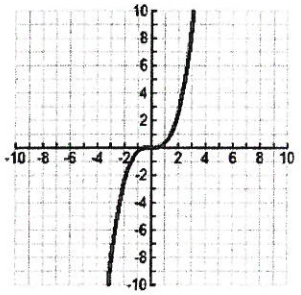
neither



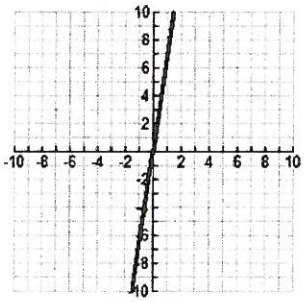
even



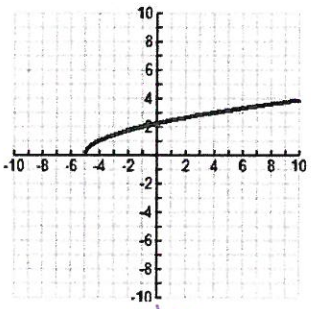
even



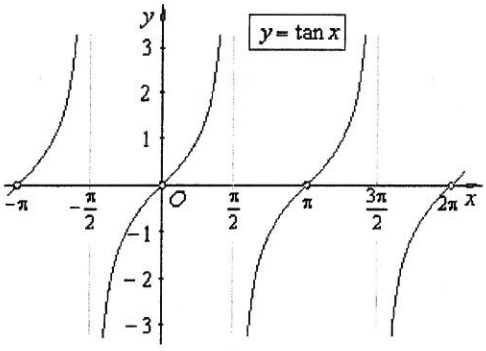
odd



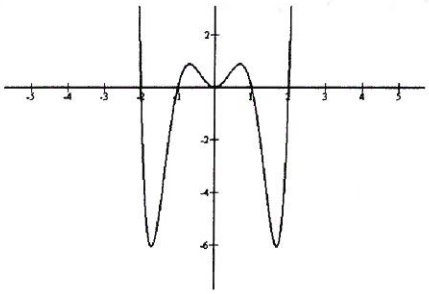
odd



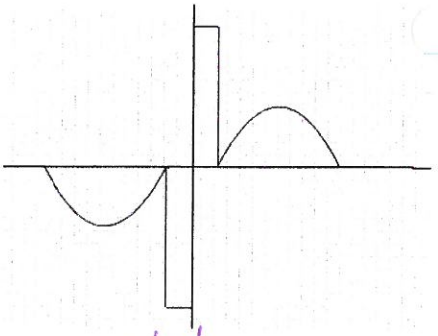
neither



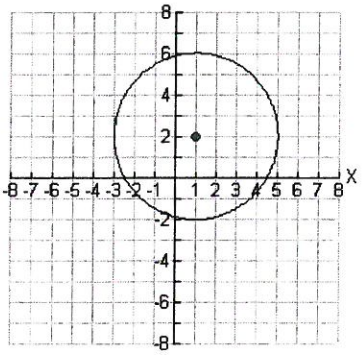
odd



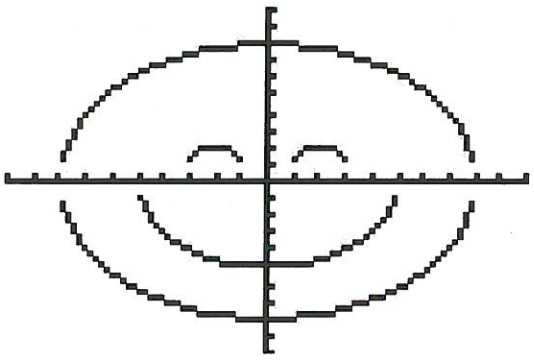
even



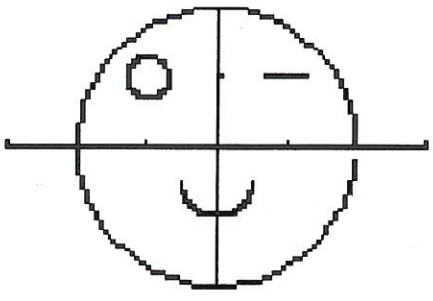
odd



neither



even



neither

Determining Evenness/Oddness from a function:

It's easy. Evaluate f(x) at a number. Then evaluate f(–x).
it's the same, then it's even. If it's the opposite, then it's odd.

Ex 1: $y = 2x$

Test: f(5) = 10
Test f(–5) = –10 → opposites

So it's odd!

Ex 2: $y = x^2 - 3$

Test: f(5) = 22
Test f(–5) = 22 same!

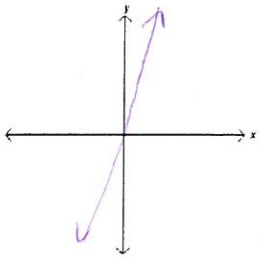
So it's even!!

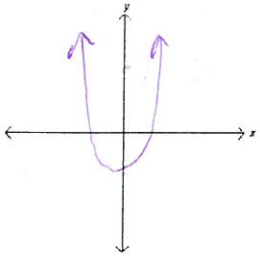
Ex 3: $y = |x - 5|$

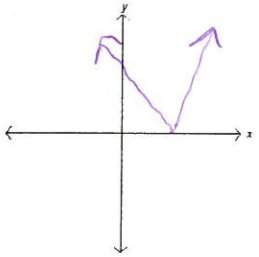
Test f(5) = 0
Test f(–5) = 10 neither!

Neither!

You can also kind of "cheat" the system by simply knowing what these functions look like.







Now you try!

2. Determine, algebraically, if the following functions/relations are even, odd or neither:

f(x)= $3x^2$ — even

f(x) = $x^3 - 2$ — neither

f(x)= 3x + 4 — neither

f(x)= $x^2 - 5$ — even

f(x)= 10x + 5 — neither

f(x)= $2(x+1)^3$ — neither

f(x) = sin (x) — odd

f(x) = cos (x) — even

f(x) = $2|x| + 10$ — even

f(x) = $x^{½}$ — neither

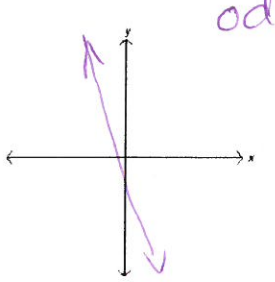
f(x) = $2x^3 + 3x$ — odd

f(x) = 1/x — odd

Practice: Determine if the function is even, odd, or neither. Sketch to confirm.

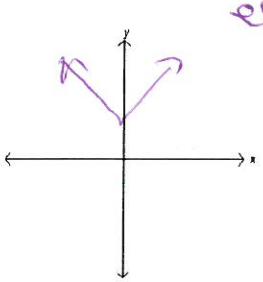
1. $y = -5x$

odd



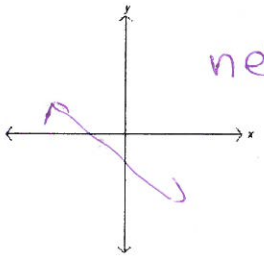
2. $y = |x| + 3$

even



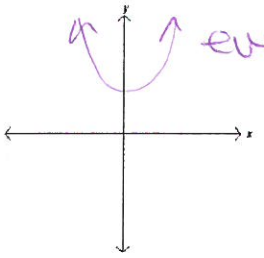
3. $y = \frac{1}{2}x - 3$

neither



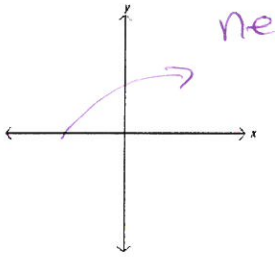
4. $y = x^2 + 1$

even



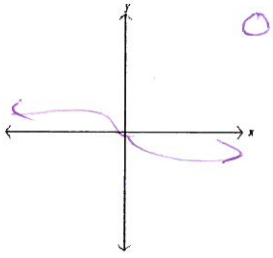
5. $y = \sqrt{x+2}$

neither



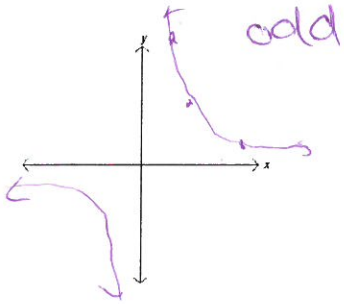
6. $y = -\sqrt[3]{x}$

odd



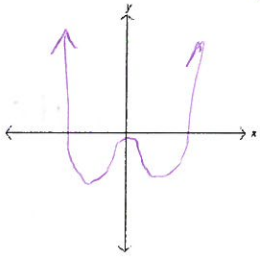
7. $y = \frac{4}{x}$

odd



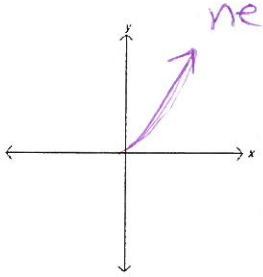
8. $y = x^4 - 4x^2$ *aka* $x^2(x+2)(x-2)$

even



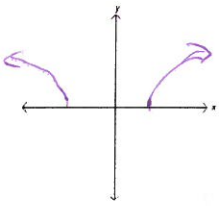
9. $y = \sqrt{x^3}$

neither



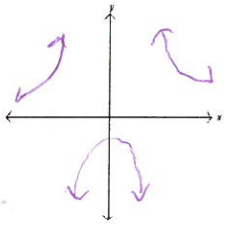
Use Desmos.com to graph these funky ones!

$y = \sqrt{x^2 - 1}$



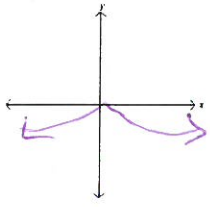
even

$y = \frac{x^2}{x^2-9}$



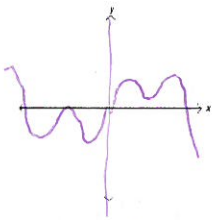
even

$y = -(x)^{\frac{2}{3}}$



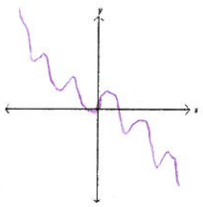
even

$y = \sin x + \sin 3x$



odd

$y = \sin 4x - x$



odd

*BONUS: A young grasshopper asked, "Is there a **function** that is both even and odd?". The sensei replied, "Yes, there is only one, so it is shy. If you graph it lightly, you may not see it, as it hides behind what is already there."*

i'm not telling . . . :)