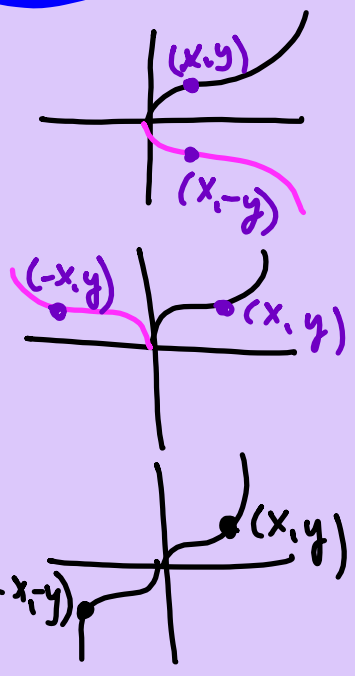
Graph Symmetry

must get original eq. back

x-axis
Sub in $-y$

y-axis
Sub in $-x$

Origin
Sub in $-x$ & $-y$



$y = 2x^2 + 1$ ψ

x-axis $-y = 2x^2 + 1$ No

y-axis $y = 2(-x)^2 + 1$
$y = 2x^2 + 1$ yes

Origin $-y = 2(-x)^2 + 1$
$-y = 2x^2 + 1$
No

$4xy + 2x^2 = 7$

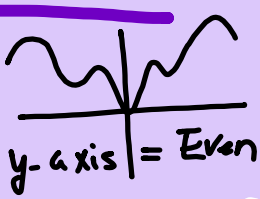
x-axis $4x(-y) + 2x^2 = 7$ No
$-4xy + 2x^2 = 7$

y-axis $4(-x)y + 2(-x)^2 = 7$
$-4xy + 2x^2 = 7$ No

Origin $4(-x)(-y) + 2(-x)^2 = 7$
$4xy + 2x^2 = 7$ yes

EVEN + ODD FUNCTIONS ← must pass vertical line test

Even $f(-x) = f(x)$
(y-axis symm)



Odd $f(-x) = -f(x)$
(origin symm.)
$-y$

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

odd = origin

Even, Odd, or Neither?

$f(x) = 3x^6 - 2x^2 + 4$
$f(-x) = 3(-x)^6 - 2(-x)^2 + 4$
$= 3x^6 - 2x^2 + 4$
EVEN

$f(x) = x^3 - x + 1$
$f(-x) = (-x)^3 - (-x) + 1$
$= -x^3 + x + 1$
$= -(x^3 - x - 1)$
Neither

$f(x) = \frac{4x}{3x^2 - 5}$

$f(-x) = \frac{4(-x)}{3(-x)^2 - 5} = \frac{-4x}{3x^2 - 5}$
$= -\frac{4x}{3x^2 - 5}$

ODD

$\frac{-1}{2}$ $\frac{1}{-2}$ $-\frac{1}{2}$

Piecewise Functions

$$f(x) = \begin{cases} -3|x+5|+2 & x<-2 \\ \sqrt[3]{x+1}+1 & -2 \le x \le 7 \\ -(x-8)^3+2 & x>7 \end{cases}$$

0	0
-1	-1
-8	-2

0	0
1	1
2	8