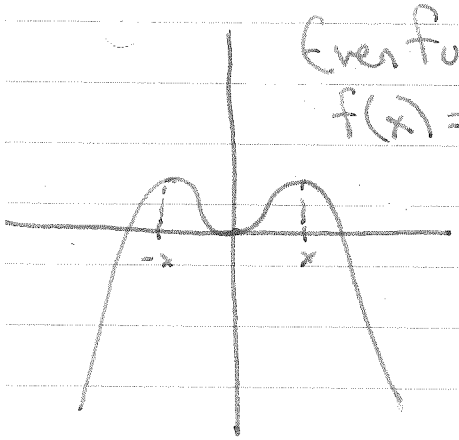
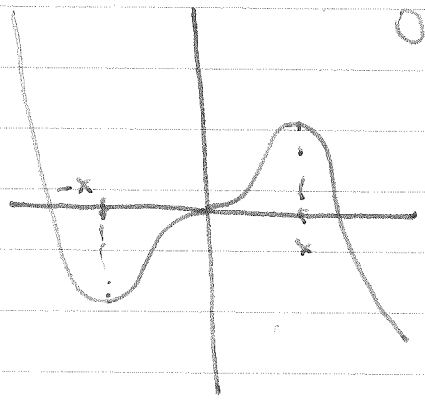


Even function

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

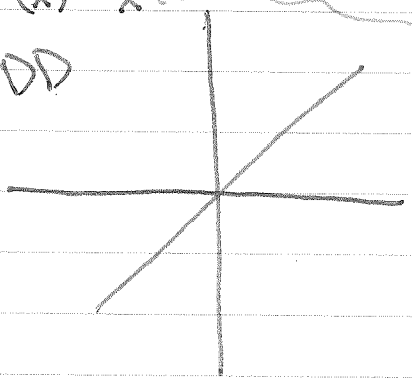


Odd function

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

Ex. $f(x) = x$

ODD



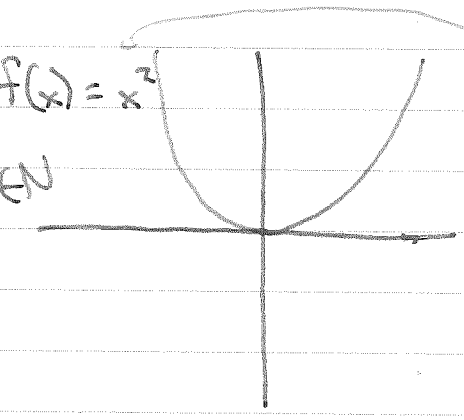
Odd because

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

symm about origin. (Geometric)

Ex: $f(x) = x^2$

EVEN



$f(-x) = (-x)^2 = (-1)^2 \cdot x^2 = x^2 = f(x)$ (analytic)

symm. around y-axis (geometric)

ODD $f(x) = x^3$

EVEN $f(x) = x^4$

EVEN $f(x) = 1 = 1 \cdot x^0$

In general, for my power function

$f(x) = Cx^{\boxed{n}}$ is $\begin{cases} \text{odd if } n \text{ is odd} \\ \text{even if } n \text{ is even} \end{cases}$

Sums of even functions are even!

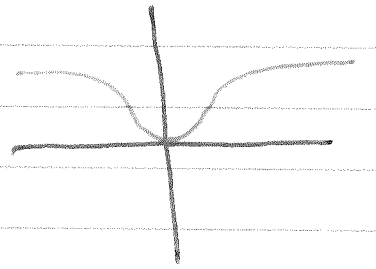
Ex: $x^2 + 2x^4$ $\xrightarrow{\text{Plug } (-x)}$ $(-x)^2 + 2(-x)^4$

$= (-1)^2 x^2 + 2(-1)^4 x^4$

Sums of odd functions are odd.

Ex: $f(x) = \dfrac{x^2}{1+x^2}$

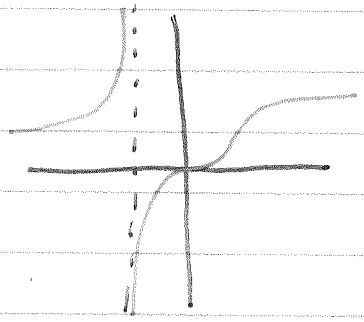
$f(-x) = \dfrac{(-x)^2}{1+(-x)^2} = \dfrac{x^2}{1+x^2}$



The product/ratio of two even functions is even

Ex: $f(x) = \dfrac{x^3}{1+x^3}$

$f(-x) = \dfrac{(-x)^3}{1+(-x)^3} = \dfrac{-x^3}{1-x^3}$



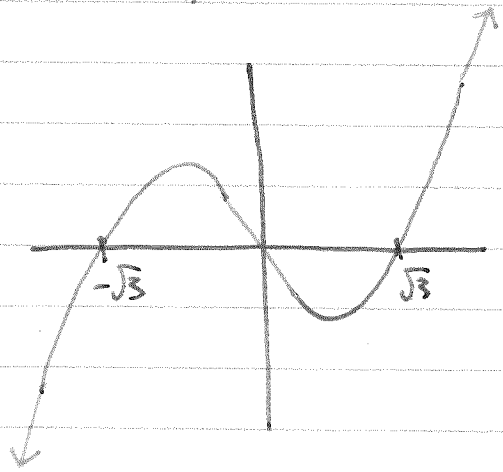
Q: What about the product/ratio of two odd functions?

Graphing simple polynomials

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

When is $x^3 = 3x$?

$x^2 = 3 \Rightarrow x = \pm\sqrt{3}$



- Find the zeroes.
- As $x \to \infty$ or $-\infty$, $x^3 - 3x \approx x^3$
- As $x \to 0$, $x^3 - 3x \approx -3x$
- Fill the gap

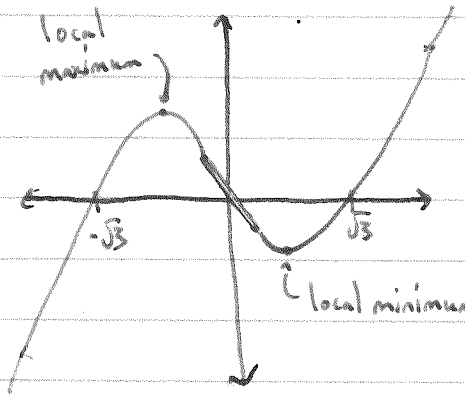
Graphing simple polynomials.

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

Find the zeros: $x^3 = 3x$

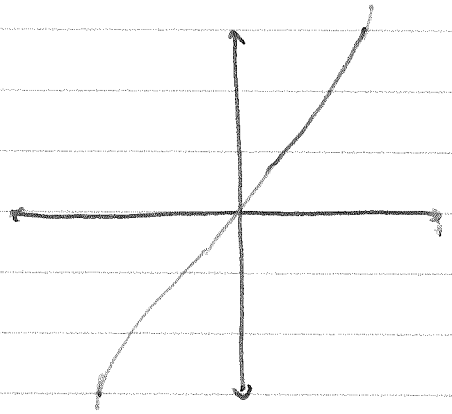
$x^2 = 3$

$x = \sqrt{3}$ or $x = -\sqrt{3}$



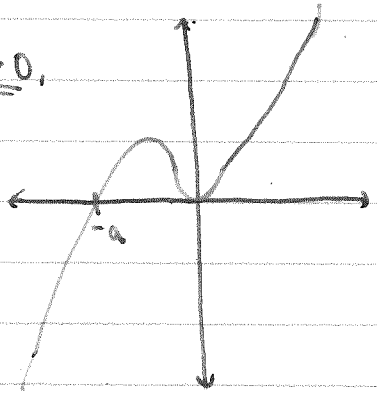
- We know how to graph individual power functions
- We know smaller degrees dominate near $x = 0$
- Larger degrees dominate as $x \to \infty$

Ex: $f(x) = x^3 + 3x$



Ex: $f(x) = x^3 + ax^2$

If $a > 0$,



If $a < 0$,