Section 2.3 Properties of Functions

Average Rate of Change from c to x is

$$\frac{\Delta y}{\Delta x} = \underbrace{\frac{f(x) - f(c)}{x - c}}_{\text{difference quotient}}$$

<u>ex</u>: Find the avg. rate of change of $f(x) = 2x^2 - 3x$ from 1 to x.

$$\frac{f(x) - f(1)}{x - 1} = \frac{\overbrace{(2x^2 - 3x)}^{f(x)} - \overbrace{(2 \cdot 1^2 - 3 \cdot 1)}^{f(1)}}{x - 1}$$

$$= \frac{2x^2 - 3x + 1}{x - 1}$$

$$\begin{array}{ccc} & 2 & \\ -1 & \times & -2 \\ & -3 & \end{array}$$

	x	-1
$2x$	$2x^2$	$-2x$
-1	$-1x$	1

$$= \frac{(2x - 1)\cancel{(x - 1)}}{\cancel{x - 1}}$$

$$= 2x - 1$$

Even, Odd, or Neither

1) A function is <u>even</u> if $f(-x) = f(x)$

Even functions have y-axis symmetry.

<u>ex</u>: $f(x) = 4 - x^2$

$f(-x) = 4 - (-x)^2$

$f(-x) = 4 - x^2$

$f(-x) = f(x)$ so f is even

2) A function is <u>odd</u> if $f(-x) = -f(x)$

Odd functions have origin symmetry

$f(x) = x^3$

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

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

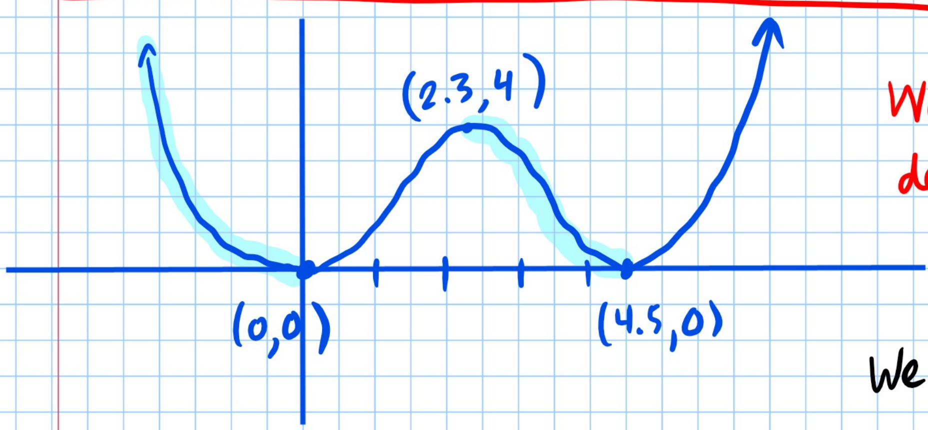
so $f(-x) = -f(x)$ so f is odd

3) A function is neither even nor odd if $f(-x) \neq f(x)$ and $f(-x) \neq -f(x)$ No symmetry

ex: $f(x) = x^2 - 4x$

$f(-x) = (-x)^2 - 4(-x)$

$f(-x) = x^2 + 4x$ Neither



We say this function decreases on $(-\infty, 0)$ and $(2.3, 4.5)$

We say this function increases on $(0, 2.3)$ and $(4.5, \infty)$

Local minima: $(0,0)$, $(4.5, 0)$

Local maximum: $(2.3, 4)$

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