SM3 VOCAB 4-4 (Analyzing Functions)

Even Function: a function that is symmetrical across the y-axis.

The square and absolute value functions are even *unless they have been shifted left or right.*

$$f(x) = x^2 \qquad f(x) = |x|$$

Mathematically, a function is even if the original function is equivalent to the function with ‘x’ replaced with ‘-x’ which means that if it is reflected across the y-axis, it should look exactly like the original equation.

$$f(x) = f(-x) \qquad f(x) = x^2 \rightarrow f(-x) = (-x)^2 \rightarrow f(-x) = (-x)(-x) \rightarrow x^2;\ f(-x) = f(x)$$

Odd function: If you reflect it across the x-axis, it looks exactly the same as if you reflect it across the y-axis. We would rather say, that a function is odd if it is symmetrical across the origin.

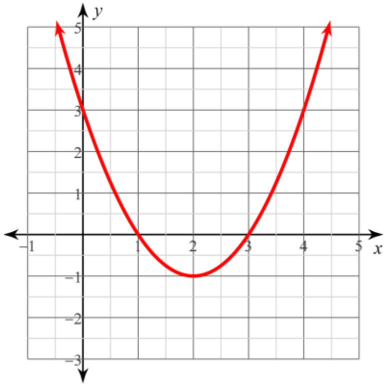
The linear function is odd *unless it has been moved either up/down or left/right* $f(x) = x$

Mathematically, a function is odd if the original function is equivalent to the function multiplied by -1 and with ‘x’ replaced with ‘-x’. This means that the graph should look exactly the same if it has been reflected across the x-axis and then reflected across the y-axis.

$$f(x) = -f(-x) \qquad f(x) = x \rightarrow -f(-x) = (-1)(-x) \rightarrow x;\ f(x) = -f(-x)$$

Average rate of change: Most functions are not linear. Since the slope of a curved graph is not constant, we can find the average rate of change between two points on the graph. This is the slope of a line passing through the two points.

<u>SM3 VOCAB 4-4 (Analyzing Functions)</u> (page 2)



<u>A Function is Increasing</u>: if a <u>tangent line</u> at a point on the graph has a positive slope, the function is increasing at that point. Functions change from increasing to/from decreasing at "peaks" or "valleys" in the graph. The function is NEITHER increasing nor decreasing at the peak or valley.

$$f(x) \uparrow for\ x = (-\infty, 2)$$

<u>A Function is decreasing</u>: if a <u>tangent line</u> at a point on the graph has a negative slope, the function is decreasing at that point. Functions change from increasing to/from decreasing at "peaks" or "valleys" in the graph.

$$f(x) \downarrow for\ x = (-\infty, 2)$$

<u>A function is positive</u>: wherever the y-value of a point is positive. Functions change to/from positive wherever they cross the x-axis. $f(x) > 0\ for\ x = (-\infty, 1] \cup [3, \infty)$

<u>Extrema</u>: the y-value of points that are extrema are either (1) the maximum or minimum y-value on the graph, OR (2) compared the points adjacent to them, are either the maximum or minimum y-value.

For the graph above there is an "absolute minimum" at (2, -1) since y = -1 is the absolute minimum y-value of the range.

<u>End behavior</u> is a description of which direction the graph is going (up or down) on the right and left ends of the graph. We use "infinity notation" to describe this. $x \to \infty$ Means "right end of the graph". We need to describe <u>both</u> the right and left ends.

as $x \to +\infty,\ y \to +\infty$ means "on the right end of the graph, the graph is going upward (forever).
as $x \to -\infty,\ y \to +\infty$ means "on the left end of the graph, the graph is going upward (forever).