3.2 Max and Min Values ... aka Extreme Values

The maximum value of a function occurs at a "peak" or at an endpoint of an interval.

The minimum value of a function occurs at a "valley" or at an endpoint.

At the peaks and valleys of functions, f'(x) = 0 (remember: this means that the rate of change, or slope, of the function is 0).

If a function has a derivative at every point in the interval $a \le x \le b$, calculate f(x) at

- All points in the interval $a \le x \le b$, where f'(x) = 0
- The endpoints $x = a$ and $x = b$ of the interval

The maximum value of f(x) on the interval $a \le x \le b$ is the largest of these values, and the minimum of f(x) on the interval is the smallest of these values.

Example 1: Find the extreme values of the function $f(x) = -2x^3 + 9x^2 + 4$ on the interval $x \in [-1, 5]$

Example 2: The amount of current, in amperes (A), in an electrical system is given by the function $C(t) = -t^3 + t^2 + 21t$, where t is the time in seconds and $0 \le t \le 5$. Determine the times at which the current is at its maximum and minimum and determine the amount of current in the system at these times.

Example 3: The amount of light intensity on a point is given by the function $l(t) = \frac{t^2+2t+16}{t+2}$, where t is the time in seconds and t Є [0,14]. Determine the time of minimal intensity.