5.1-What Does f' say about f?

Graphical Interpretations of f':

If $f'(x) > 0$ for all $x \in (a, b)$, then f is

If $f'(x) < 0$ for all $x \in (a, b)$, then f is

Example: Draw a function f from $(1, 0)$ to $(4, 5)$ with $f' > 0$.

Definitions:

a differentiable function f is *concave up* on an interval (a, b) if and only if

a differentiable function f is *concave down* on an interval (a, b) if and only if

Therefore...

If $f''(x) > 0$ for all $x \in (a, b)$, then

If $f''(x) < 0$ for all $x \in (a, b)$, then

Examples:

True or False? There exists a function f such that $f(x) > 0$, $f'(x) < 0$, and $f''(x) > 0$ for all x. If true, sketch it; if false, explain why not

Sketch the graph of a continuous function f on $[0, \infty)$ which satisfies the following:

$f(0) = 0,\ f(2) = 2,\ f(3) = 1$

$f'(x) > 0$ if $x \in (0, 2)$

$f'(x) < 0$ if $x \in (2, \infty)$

$f''(x) > 0$ if $x \in (3, \infty)$

$f''(x) < 0$ if $x \in (0, 3)$

$\lim_{x \to \infty} f(x) = 0$

On Your Own: #1, 3, 5, 11, 13, 17, 19, 21