WARMUP

Calculate $f'(x)$ if $f(x) = 3x^2+5x-7$ using definition of derivative

$$f'(x) = 6x+5$$

2A) $f(x) = 3\sqrt{x}$

$$f'(x) = \lim_{h\to 0} \frac{(3\sqrt{x+h} - 3\sqrt{x})}{h} \frac{(3\sqrt{x+h} + 3\sqrt{x})}{(3\sqrt{x+h} + 3\sqrt{x})}$$

$$f'(x) = \lim_{h\to 0} \frac{9(x+h) - 9x}{h(3\sqrt{x+h} + 3\sqrt{x})}$$

$$f'(x) = \lim_{h\to 0} \frac{\cancel{9x} + 9\cancel{h} - \cancel{9x}}{\cancel{h}(3\sqrt{x+h} + 3\sqrt{x})}$$

$$f'(x) = \frac{9}{3\sqrt{x} + 3\sqrt{x}}$$

$$f'(x) = \frac{9}{6\sqrt{x}} = \frac{3}{2\sqrt{x}}$$

Section 2.5 Interpretations of the Derivative

Our notation for derivative of a function $f(x)$ is $f'(x)$.

There are other notations:

If $y = f(x)$, $\frac{dy}{dx} = f'(x)$

derivative of y with respect to x

If s is the position function of an object, then $\frac{ds}{dt}$ is instantaneous rate of change, or velocity, so $v = \frac{ds}{dt}$

$$h(t) = -16t^2 + v_0 t + h_0$$

$$v(t) = -32t + v_0 \implies v_f = at + v_i$$

$\frac{d}{dx}(f(x))$, $\frac{d}{dx}(y)$, $\left.\frac{dy}{dx}\right|_{x=2}$

derivative evaluated at $x=2$, so it means $f'(2)$.

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$T = f(t)$

time in minutes

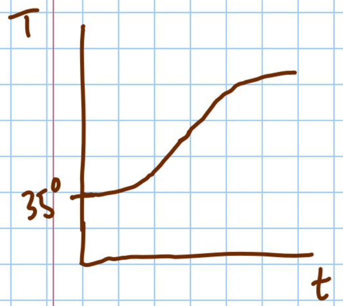
temp. in °F

a) What is the sign of $f'(t)$?

Since T is increasing, $\frac{dT}{dt} = f'(t) > 0$

b) What are the units of $f'(20)$?

What does $f'(20) = 2$ mean?



$$f'(20) = \left.\frac{dT}{dt}\right|_{t=20} = \frac{°F}{\text{min}}$$

$f'(20) = 2$

At 20 min, rate of change of temp. is 2 °F/min

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$\underset{\substack{\uparrow \\ \text{\# of items sold}}}{q} = \underbrace{f(p)}_{\text{function of price}}$

a) $f(150) = 2000$

when price is \$150, 2000 items are sold.

b) $f'(150) = -25$

$$f'(p) = \frac{dq}{dp} = \frac{\text{\# of items sold}}{\$}$$

when price is \$150, # of items sold decreases by 25 $\frac{\text{items}}{\$}$

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1, 3, 11, 14, 19