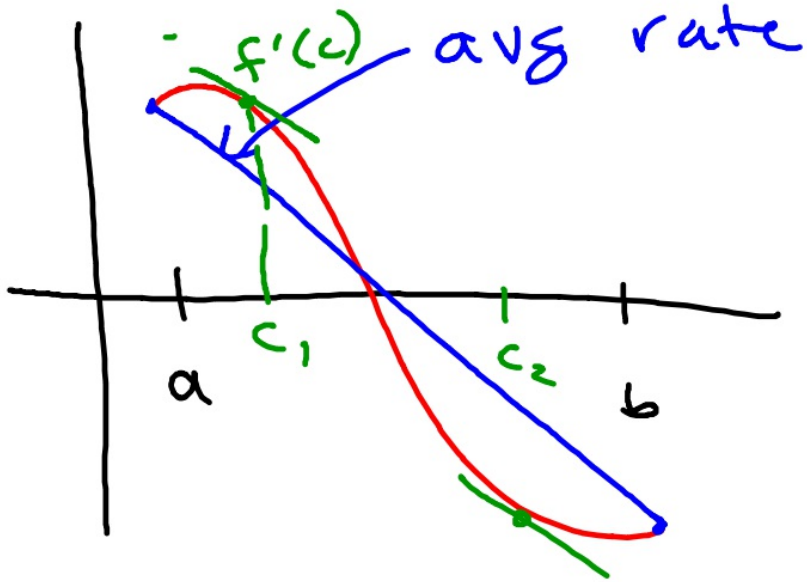
Mini Lesson: "Average Value"

What was the Mean Value Theorem?



$$\frac{f(b)-f(a)}{b-a} = f'(c)$$

avg. rate = instant rate

How do you find the mean/average of n things?

$$\overline{X}_n = \frac{X_1 + X_2 + X_3 + \ldots + X_n}{n}$$

$$\overline{X}_n = \frac{\sum_{i=1}^{n} X_i}{n}$$

$$\overline{X}_n = \frac{1}{n} \lim_{n \to \infty} \sum_{i=1}^{n} X_i$$

$n \to \infty$

$$\overline{X}_n = \underbrace{\frac{1}{n}}_{\text{div. by \# of things}} \underbrace{\int^{2} X_i}_{\text{sum of inf. many things}}$$

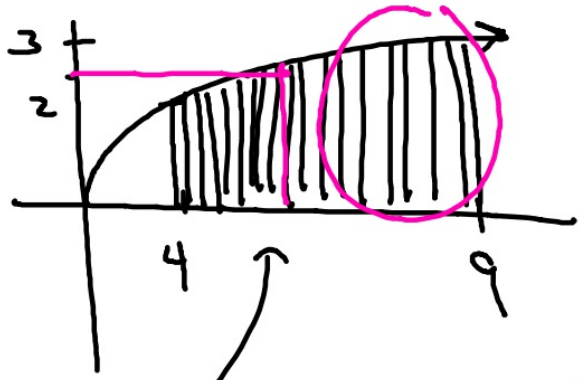
Average Value Formula

$$f_{avg} = \underbrace{\frac{1}{b-a}\int_a^b f(x)\,dx}$$

this gives the average value that $f(x)$ takes on over $[a,b]$

Find the average value of f over the interval $[4, 9]$

$f(x) = \sqrt{x}$



need the avg "length" of so many "sticks"

$$\frac{1}{5}\int_4^9 \sqrt{x}\,dx \qquad \int x^{1/2}$$

$$\frac{1}{5}\left[\frac{2}{3}x^{3/2}\right]_4^9$$

$$\frac{1}{5}\left[\cancel{\frac{2}{3}(9)^{3/2}} - \frac{2}{3}(4)^{3/2}\right]$$

$$\cancel{18} - \frac{16}{3}$$

$$\frac{1}{5}\left[\frac{54}{3} - \frac{16}{3}\right]$$

$$\frac{1}{5}\cdot\frac{38}{3} \longrightarrow 38/15 \approx \boxed{2.5\overline{3}}$$