L'Hopital's Rule

$$\lim_{x \to 5} \frac{x^2 - 25}{5 + 4x - x^2}$$

$$\frac{0}{0}$$

$\uparrow$

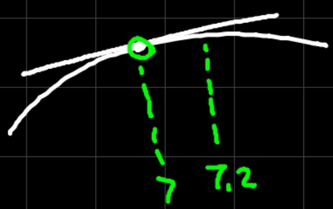
indeterminant

$$\frac{\infty}{\infty}$$

$$y - y_1 = m(x - x_1)$$

$$y = y_1 + m(x - x_1)$$ f at $x = a$

$$L(x) = f(a) + f'(a)(x - a)$$



$$\lim_{x \to a} \frac{f(x)}{g(x)} = \lim_{x \to a} \frac{\cancel{f(a)} + f'(a)(x-a)}{\cancel{g(a)} + g'(a)(x-a)}$$

$$= \lim_{x \to a} \frac{f'(a)\cancel{(x-a)}}{g'(a)\cancel{(x-a)}}$$

$$= \lim_{x \to a} \frac{f'(a)}{g'(a)}$$

L'Hopital's Rule

If $\lim_{x \to a} \frac{f(x)}{g(x)}$ is of indeterminant form

then $\lim_{x \to a} \frac{f(x)}{g(x)} = \lim_{x \to a} \frac{f'(x)}{g'(x)}$

$$\lim_{x \to 3} \frac{x^2 - 9}{x - 3} = \lim_{x \to 3} \frac{2x}{1} = 6$$

$$\lim_{x \to 9} \frac{\sqrt{x} - 3}{x - 9} = \lim_{x \to 9} \frac{\frac{1}{2\sqrt{x}}}{1} = \frac{1}{6}$$

$$\lim_{x \to 0} \frac{\sin x}{x} = \lim_{x \to 0} \frac{\cos x}{1} = 1$$

$$\lim_{x \to 0} \frac{\sin 3x}{5x} = \lim_{x \to 0} \frac{3\cos 3x}{5} = \frac{3}{5}.$$

TEST - 10 Qs → 50 pts. **CALCULATORS!**

2 rectilinear motion

3 implicit diff (incl. one tan. line)

2 related rate

3 linearization

- one "regular"
- one where you pick where to linearize
- one $\sqrt[3]{\ }$ or $\sqrt{\ }$