Wednesday, August 28

Describe the process for finding the limit and what the meaning of the limit.

August 28

Students will verbally explain how to find the limit using L'Hopital's Rule

(using the words:
indeterminate, derivative, evaluate, limit...)

$$\lim_{x\to 3} \frac{x^2-9}{x^2-5x+6}$$

$$\frac{3^2-9}{3^2-5(3)+6} = \frac{0}{0}$$

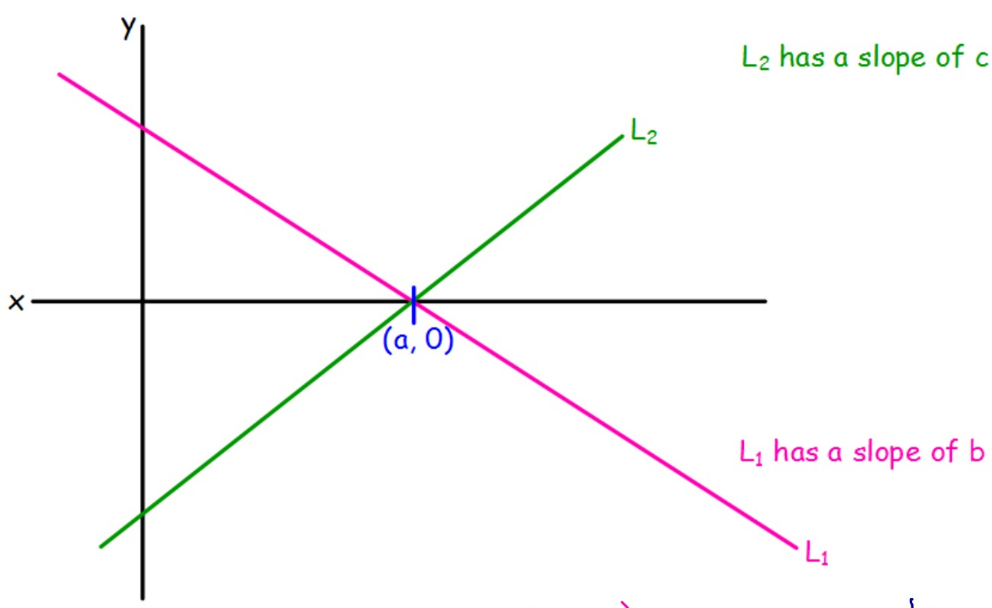
$$\frac{x^2-9}{x^2-5x+6} = \frac{(x-3)(x+3)}{(x-3)(x-2)} = \frac{x+3}{x-2}$$

$$\lim_{x\to 3} \frac{x^2-9}{x^2-5x+6} = \lim_{x\to 3} \frac{x+3}{x-2} = \frac{3+3}{3-2} = 6$$

Indeterminate forms

$$\frac{0}{0},\ \frac{\infty}{\infty}$$

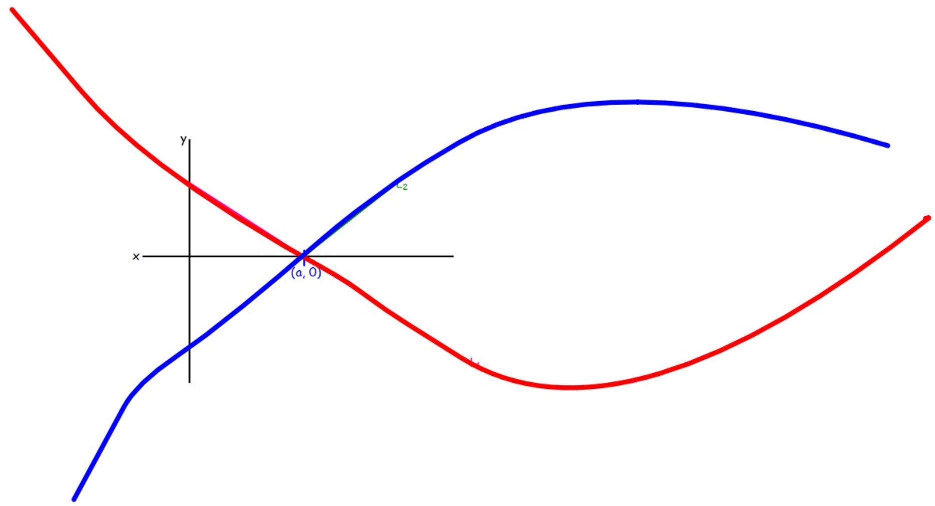
$$(\infty-\infty,\ 0\cdot\infty,\ 1^{\infty},\ \infty^{0},\ 0^{0})$$



Equation for L_1 $\quad y = b(x-a)$

Equation for L_2 $\quad y = c(x-a)$

$$\text{ratio} = \frac{b}{c}$$



L'Hopital's Rule

$\lim_{x \to 3} \frac{x^2-9}{x^2-5x+6}$

If $\lim_{x \to a} \frac{f(x)}{g(x)} = \frac{0}{0}$ $\left(\text{or } \frac{\infty}{\infty}\right)$

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

$= \frac{0}{0}$

$\rightarrow$ L'Hopital's Rule

$\lim_{x \to 3} \frac{2x}{2x-5} = \frac{2(3)}{2(3)-5} = 6$

$$\lim_{x\to 1} \frac{\ln(x)}{1-x^3}$$

$$= \frac{\ln(1)}{1-1^3} = \frac{0}{0}$$

L'Hop

$$\lim_{x\to 1} \frac{\frac{1}{x}}{-3x^2} = \frac{\frac{1}{1}}{-3(1)^2} = \frac{1}{-3}$$

$$\lim_{x\to \pi} \frac{\sin(5x)}{\sin(9x)}$$

$$= \frac{\sin(5\pi)}{\sin(9\pi)} = \frac{0}{0}$$

L'Hop

$$\lim_{x\to \pi} \frac{\cos(5x)\cdot 5}{\cos(9x)\cdot 9} = \frac{5\cos(5\pi)}{9\cos(9\pi)} = \frac{-5}{-9} = \frac{5}{9}$$

$$\lim_{x\to 0} \frac{1-\cos x}{x^3}$$

$$\frac{1-\cos(0)}{0^3} = \frac{0}{0}$$

L'Hop

$$\lim_{x\to 0} \frac{\sin x}{3x^2} = \frac{\sin 0}{3(0)^2} = \frac{0}{0}$$

L'Hop

$$\lim_{x\to 0} \frac{\cos x}{6x} = \frac{\cos(0)}{6(0)} = \frac{1}{0} \to \text{undefined}$$

$$\lim_{x\to \infty} \frac{x^3-4x}{e^x}$$

$$= \frac{\infty^3-4(\infty)}{e^\infty} = \frac{\infty}{\infty}$$

L'Hop

$$\lim_{x\to \infty} \frac{3x^2-4}{e^x} = \frac{\infty}{\infty}$$

L'Hop

$$\lim_{x\to \infty} \frac{6x}{e^x} = \frac{\infty}{\infty} \to$$

L'Hop

$$\lim_{x\to \infty} \frac{6}{e^x} = \frac{6}{\infty} = 0$$

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#1-33 (odd)