Calc AB

Lesson 79

12/15/15

Agenda: 12/15/15
Lesson 79
L'Hopital's Rule

Test
- 6 multiple choice
- 2 FRQs
  - Jagged Lines
  - min/max/ inflection points

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lots of functions not defined at points
But we want to know how they behave near them.

Can simplify some:

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

However some we can't:

$$\lim_{x\to 0} \frac{\sin x}{x} \quad \text{or} \quad \lim_{x\to 1} \frac{\ln x}{x-1}$$

Indeterminate forms: $\dfrac{\lim_{x\to a} f(x)}{\lim_{x\to a} g(x)} = \dfrac{0}{0}$ or $\pm\infty$ then we can use L'Hopital's Rule

L'Hopital Rule's:

If $\dfrac{\lim_{x\to a} f(x)}{\lim_{x\to a} g(x)}$ is an indeterminate form and if $\lim_{x\to a} \dfrac{f'(x)}{g'(x)}$ exists, then

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

Ex. $\lim_{x\to 0} \dfrac{\sin x}{x}$

$\lim_{x\to\infty} \dfrac{\cos x + 2x}{6x^2}$

$\lim_{x\to\infty} \dfrac{e^x}{x^2}$

$\lim_{x\to\pi} \dfrac{\sin x}{1-\cos x}$