Calc AB

Lesson 17

8/19/15

Agenda: 8/19/15

HW leader:

Lesson 17

Infinity as a limit

Undefined limits

- Quiz 2 on Friday

Period 3: Kira M.

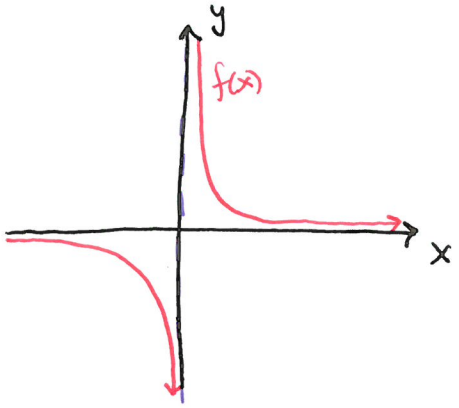
Period 4: Jeremy N.

★ Handout WS 2

★ Infinity describes a quantity whose value is increasing without bound.

★ Infinity is **NOT** a number.

Consider $f(x) = \frac{1}{x}$



$\lim_{x \to 0^+} \frac{1}{x} = +\infty$

$\lim_{x \to 0^-} \frac{1}{x} = -\infty$

These limits are still undefined but this gives us more information.

$\lim_{x \to 0} \frac{1}{x}$ = DNE or Undefined because $\lim_{x \to 0^+} \frac{1}{x} \neq \lim_{x \to 0^-} \frac{1}{x}$

Properties of Limits:

If $\lim_{x \to a} f(x)$ and $\lim_{x \to a} g(x)$ exist then:

1. $\lim_{x \to a} c \cdot f(x) = c \cdot \lim_{x \to a} f(x)$

2. $\lim_{x \to a} (f(x) + g(x)) = \lim_{x \to a} f(x) + \lim_{x \to a} g(x)$

3. $\lim_{x \to a} (f(x) \cdot g(x)) = \left(\lim_{x \to a} f(x)\right) \cdot \left(\lim_{x \to a} g(x)\right)$

4. $\lim_{x \to a} \left(\frac{f(x)}{g(x)}\right) = \frac{\lim_{x \to a} f(x)}{\lim_{x \to a} g(x)}$ and $\lim_{x \to a} g(x) \neq 0$

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Ex. 17.1 Evaluate $\lim_{x\to\infty} \dfrac{4x^2+x+6}{3x^2+1}$

[As $x\to\infty$ we think $\frac{\infty}{\infty}$]

$$= \lim_{x\to\infty} \frac{4+\frac{1}{x}+\frac{6}{x^2}}{3+\frac{1}{x^2}}$$

[Highest power of x gives issue]

$$= \frac{\lim_{x\to\infty} 4+\frac{1}{x}+\frac{6}{x^2}}{\lim_{x\to\infty} 3+\frac{1}{x^2}}$$

[We can use properties of Limits!]

$$= \frac{4+0+0}{3+0} = \boxed{\frac{4}{3}}$$

Ex. Evalnate $\lim_{x\to-\infty} \dfrac{x-5x^2+x^3}{3+7x^2}$

[For polynomials as $x\to\pm\infty$ we only need to look at the highest power of x in top/bottom]

$$= \lim_{x\to-\infty} \frac{x^3}{7x^2}$$

$$= \lim_{x\to-\infty} \frac{x}{7} = \boxed{-\infty}$$

Ex 17.2 $\lim_{x\to\infty} \dfrac{5x+7}{13x^2+10x+2}$

$$= \lim_{x\to\infty} \frac{5}{13x} = \boxed{0}$$