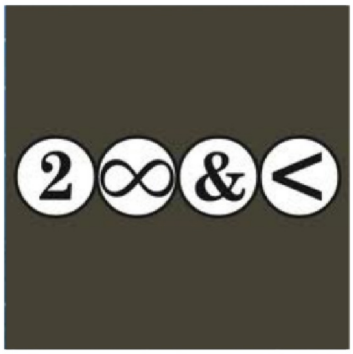
1.3 Properties of Limits - Part II

Investigate!



click if you are not a geek!

1. Determine each of the following limits graphically.

a) $\lim_{x\to\infty} \frac{6x^2-2x-1}{5x^2-x+1}$

b) $\lim_{x\to\infty} \frac{7x^3-4}{3x^3+2x^2-1}$

c) $\lim_{x\to\infty} \frac{3x+1}{4x-5}$

d) $\lim_{x\to\infty} \frac{4+2x+x^2}{1-x+2x^2}$

- What pattern do you notice in the answers?
- What do each of these cases have in common?
- What is the value of $\lim_{x\to\infty} \frac{1}{x}$?
- How can we use the fact that $\lim_{x\to\infty} \frac{1}{x} = 0$ to help determine these limits algebraically?

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method:
- divide all terms by the highest power of x in the denominator
- simplify
- evaluate the limit as $x \to \pm\infty$

- What does this limit represent graphically?

Ex. 1 Determine the following limit algebraically.

$$\lim_{x\to\infty} \frac{6x^2 - 5x + 2}{-7x^2 + 3x}$$

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2. Determine each of the following limits graphically.

a) $\lim_{x\to\infty} \frac{x^2+x+2}{4x^3-1}$ b) $\lim_{x\to\infty} \frac{1}{x+3}$ c) $\lim_{x\to\infty} \frac{2x}{x^2+2x-3}$

- What pattern do you notice in the answers?

- What do each of these cases have in common?

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3. Determine each of the following limits graphically.

a) $\lim_{x\to\infty} \frac{2x^3}{x^2+1}$ b) $\lim_{x\to\infty} \frac{3x^4-x}{x^2+1}$ c) $\lim_{x\to\infty} \frac{6x^2}{5}$

- What pattern do you notice in the answers?

- What do each of these cases have in common?

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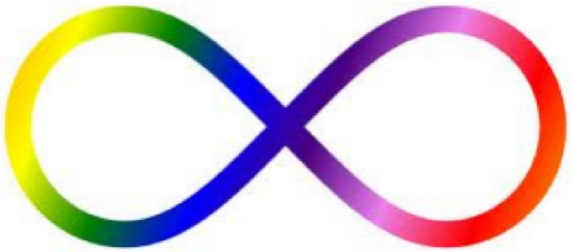
Summary...

for limits to infinity

1. degree of numerator = degree of denominator
   limit = ratio of leading coefficients

2. degree of numerator < degree of denominator
   limit = 0

3. degree of numerator > degree of denominator
   limit = $\pm\infty$



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4. Simplify and determine the limit without graphing.

a) $\lim_{x\to\infty} \dfrac{\frac{5}{x}}{\frac{6}{x} - \frac{1}{x^2}}$

b) $\lim_{x\to\infty} \dfrac{\frac{3}{x^3} + \frac{2}{x^2}}{\frac{1}{x}}$

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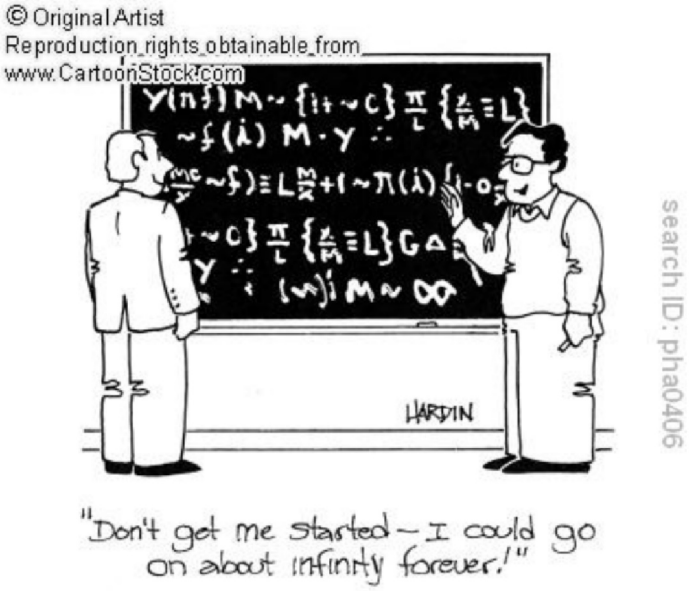
Homework
Handout "Limits to Infinity"



"Don't get me started – I could go on about infinity forever!"