Math 1220 #14
Indeterminate Forms of Type 0/0

Previously we found the limit of an expression which appeared to approach $\frac{0}{0}$.

Determine this limit. $\lim_{x\to 2} \frac{x^2-2x}{x^2+3x-10}$

We also were able to geometrically determine this limit. $\lim_{x\to 0} \frac{\sin x}{x}$

L'Hopital's Rule:

If $\lim_{x\to a} f(x) = \lim_{x\to a} g(x) = 0$ and $\lim_{x\to a} \frac{f'(x)}{g'(x)}$ exists (either finite or $\pm\infty$),

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

This makes both of the previous problems more simple.

EX 1

Determine these limits using the rule above.

1a)

$\lim_{x\to 2} \frac{x^2-2x}{x^2+3x-10}$

1b)

$\lim_{x\to 0} \frac{\sin x}{x}$

EX 2

$\lim_{x\to 0} \frac{e^x - e^{-x}}{2sin\ x}$

EX 3

$$\lim_{x \to 0^+} \frac{7^{\sqrt{x}} - 1}{2^{\sqrt{x}} - 1}$$

EX 4

$$\lim_{x\to 0} \frac{\sin\ x - \tan\ x}{x^2 \sin\ x}$$

EX 5

$$\lim_{x\to 0} \frac{\cos\ x}{x}$$

EX 6

$$\lim_{x\to 0^+} \frac{\int_0^x \sqrt{t}\cos\ t dt}{x^2}$$

EX 7

$$\lim_{x\to 0^-} \frac{\sin\ x + \tan\ x}{e^x + e^{-x} - 2}$$