

Math 1220 #15

Other Indeterminate Forms

Other Indeterminate Forms $\frac{\infty}{\infty}$

$$\lim_{x \rightarrow \infty} \frac{x}{e^x}$$
$$\lim_{x \rightarrow \infty} \frac{x^2 + 4x - 5}{3x^2 - 2x}$$

L'Hopital's rule for $\frac{\infty}{\infty}$

If $\lim_{x \rightarrow a} |f(x)| = \lim_{x \rightarrow a} |g(x)| = \infty$ then

$$\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \lim_{x \rightarrow a} \frac{f'(x)}{g'(x)} \text{ assuming } \lim_{x \rightarrow a} \frac{f'(x)}{g'(x)} \text{ exists (finite or } \infty \text{).}$$

Now use l'Hopital's Rule for this:

$$\lim_{x \rightarrow \infty} \frac{x}{e^x}$$

EX 1

$$\lim_{x \rightarrow \infty} \frac{x^9}{e^x}$$

EX 2

$$\lim_{x \rightarrow \infty} \frac{(\ln x)^2}{2^x}$$

Indeterminate Forms $0 \cdot \infty$ and $\infty - \infty$ **EX 3**

$$\lim_{x \rightarrow 0} 3x^2 \csc^2 x$$

EX 4

$$\lim_{x \rightarrow \pi/2} (\tan x - \sec x)$$

Indeterminate Forms $0^0, \infty^0, 1^\infty$

EX 5

$$\lim_{x \rightarrow 0} (\cos x)^{1/x^2}$$

EX 6

$$\lim_{x \rightarrow 0^+} x^x$$

Indeterminate Forms	NOT Indeterminate Forms
$\frac{0}{0}$	1^0
$\frac{\pm\infty}{\pm\infty}$	0^∞
$0 \cdot \infty$	∞^∞
$\infty - \infty$	$\infty + \infty$
0^0	$\infty \cdot \infty$
∞^0	$\frac{0}{\infty}$
1^∞	$\frac{\infty}{0}$