WARM UP

1. $$\int \frac{x+1}{x^2+2x-8}\,dx$$

2. If $\int_a^b f(x)\,dx = a + 2b$, then $\int_a^b (f(x)+5)\,dx =$

L'Hôpital's Rule
Revisited

Objective:

- Evaluate limits in indeterminate form using L'Hôpital's Rule.
- Quotient, Product, Difference, and Power

Review: Quotient

L' Hôpital's Rule states, when finding a limit:

$$\lim_{x \to c} \frac{f(x)}{g(x)} = \lim_{x \to c} \frac{f'(x)}{g'(x)}$$

We used this when f(x)/g(x) = 0/0 or $\frac{\infty}{\infty}$ when 'c' was substituted.

There are several expressions which are considered to have an indeterminate form.

$$\frac{0}{0}, \quad \frac{\infty}{\infty}, \quad 0 \bullet \infty,$$

$$1^{\infty}, \quad \infty - \infty, \quad \infty^0 \text{ and } 0^0$$

Working with Indeterminate form $0 \cdot \pm\infty$ (product)

Change the product into a quotient

$$f \cdot g = \frac{f}{\frac{1}{g}} \ or \ \frac{g}{\frac{1}{f}}$$

Example 1: $\lim_{x \to 0^+} \sqrt{x} \cdot lnx$

Example 2: $\lim_{x \to 0} \cot(2x) \sin(6x)$

Example 3: $\lim_{x \to -\infty} x e^{x}$

Working with Indeterminate form $\infty - \infty$ (difference)

Example 4: $\lim_{x \to 1} \left(\frac{1}{\ln x} - \frac{1}{x-1} \right)$

Working with Indeterminate form (powers) 0^0 1^{∞} ∞^0

Example 5: $\lim_{x \to 0^+} x^x$

Example 6: $\lim_{x \to \infty} (1 + \frac{2}{x})^x$