Goals

We will

- memorize the seven indeterminate forms (bad things),
- learn a method for handling two indeterminate forms, and
- use this technique to figure out why they are bad.

Indeterminate Forms

$\frac{0}{0}$
$\frac{\infty}{\infty}$
$\infty - \infty$
$0 \cdot \infty$
0^0
1^∞
∞^0

L'Hôpital's Rule

$$\text{If } \lim_{x\to a} \frac{f(x)}{g(x)} \overset{0/0}{=} \text{ and}$$
$$\lim_{x\to a} f'(x) \text{ and } \lim_{x\to a} g'(x) \text{ exist, then}$$
$$\lim_{x\to a} \frac{f(x)}{g(x)} = \lim_{x\to a} \frac{f'(x)}{g'(x)}.$$

Example

$$\lim_{x\to\pi} \frac{\sin x}{x-\pi} \overset{0/0}{=} \text{L'Hôpital's Rule}$$
$$\lim_{x\to\pi} \frac{\cos x}{1} = -1.$$

Why are they bad?

- Calculate $\lim_{x \to 0} \dfrac{e^x - 1}{x}$.
- Calculate $\lim_{x \to 0} \dfrac{e^{2x} - 1}{x}$.
- Calculate $\lim_{x \to 0} \dfrac{\sin(5x)}{x}$.
- Based on these examples, why is $0/0$ bad? Note, the etymology will be useful here.

Results

You now know

- the seven, indeterminate forms
- how to handle two forms ($0/0$ and ∞/∞)

and you understand why two forms are indeterminate.