# C12 - 1.6 - e Limit Hmk

$$e = \sum_{k=0}^{\infty} \frac{1}{k!} = \frac{1}{0!} + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} + \frac{1}{5!} + \frac{1}{6!} + \cdots \approx 2.718\ldots$$

$$e = 2 + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{2}{3 + \cfrac{3}{4 + \cfrac{4}{5 + \cdots}}}}} \approx 2.718$$

$$\lim_{x \to \pm\infty} \left(1 + \frac{1}{x}\right)^{x} = \lim_{x \to 0} (1 + x)^{\frac{1}{x}} = e \approx 2.718$$

Must be reciprocals of each other. Make them!

**Euler's Id**

$$e^{i\pi} + 1 = 0$$

$$\lim_{x \to \infty} \left(1 + \frac{2}{x}\right)^{x} =$$

$$\lim_{x \to \infty} \left(\left(1 + \frac{2}{x}\right)^{x}\right)^{\frac{2}{2}} =$$

Exponent of 1

Separate Fractions

$$\left(\left(1 + \frac{2}{x}\right)^{\frac{x}{2}}\right)^{2} = e^{2}$$

$$\lim_{x \to -\infty} \left(1 - \frac{4}{x}\right)^{x} =$$

$$\lim_{x \to -\infty} \left(\left(1 - \frac{4}{x}\right)^{x}\right)^{\frac{-4}{-4}} =$$

$$\lim_{x \to -\infty} \left(\left(1 - \frac{4}{x}\right)^{-\frac{x}{4}}\right)^{-4} = e^{-4}$$

$$\lim_{x \to 0} \left(1 + \frac{x}{3}\right)^{\frac{1}{x}} =$$

$$\lim_{x \to 0} \left(\left(1 + \frac{x}{3}\right)^{\frac{1}{x}}\right)^{\frac{3}{3}} =$$

$$\lim_{x \to 0} \left(\left(1 + \frac{x}{3}\right)^{\frac{3}{x}}\right)^{3} = e^{3}$$

$$\lim_{x \to \infty} \left(1 + \frac{3}{x}\right)^{x} =$$

$$\lim_{x \to 0} \left(1 + \frac{x}{2}\right)^{\frac{1}{x}} =$$

$$\lim_{x \to \infty} \left(1 - \frac{5}{x}\right)^{x} =$$

$$\lim_{x \to 0} \left(1 + \frac{x}{3}\right)^{\frac{1}{x}} =$$

$$\lim_{x \to \infty} \left(1 - \frac{1}{2x}\right)^{x} =$$

$$\lim_{x \to -\infty} \left(1 + \frac{4}{x}\right)^{-x} =$$