Assignment 14

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$$f(x) = \frac{1}{1-x}$$

Find the derivatives:

$$f'(x) = \frac{\frac{1}{1-x}}{1!}x$$

$$f''(x) = \frac{\frac{1}{1-x}}{2!}x^2$$

$$f'''(x) = \frac{\frac{1}{1-x}}{3!}x^3$$

Do some plugging in to get:

$$1 + \frac{1x}{1!} + \frac{2x^2}{2!} + \frac{6x^3}{3!}$$

$$1 + x + x^2 + x^3$$

$$\frac{1}{1-x} = \sum_{n=0}^{\infty} x^n$$

$$f(x) = e^x$$

Find the derivatives:

$$f'(x) = \frac{e^x}{1!}$$

$$f''(x) = \frac{e^x}{2!}$$

$$f'''(x) = \frac{e^x}{3!}$$

Plugging in:

$$1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!}$$

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}$$

$$f(x) = ln(1+x)$$

Find the derivatives:

$$f'(x) = \frac{ln(1+x)}{1!}$$

$$f''(x) = \frac{ln(1+x)}{2!}$$

$$f'''(x) = \frac{ln(1+x)}{3!}$$

Plugging in:

$$x - \frac{x^2}{2} + \frac{x^3}{3}$$

$$ln(1+x) = \sum_{n=0}^{\infty} -1^{n+1} \frac{x^n}{n}$$