

## Recitation #22: Working with Taylor series

### Warm up:

True or False: To approximate  $\frac{\pi}{3}$ , one could substitute  $x = \sqrt{3}$  into the Maclaurin series for  $\tan^{-1} x$ ?

### Group work:

**Problem 1** Use power series to evaluate the limit

$$\lim_{x \rightarrow 0} \frac{\ln(1 + x^2)}{1 - \cos x}$$

**Problem 2** Given that

$$f(t) = \int_0^t x^2 \tan^{-1}(x^4) dx$$

approximate  $f\left(\frac{1}{3}\right)$  with the first four non-zero terms of a power series. Estimate how close this approximation is.

**Problem 3** Identify the function represented by the power series

$$\sum_{k=0}^{\infty} \frac{k(k-1)x^k}{7^k}$$

**Problem 4** Use power series to determine a (series) solution to the initial value problem

$$y'' - xy' + y = 0 \quad y(0) = 1 \quad y'(0) = 0$$