Choose one of the following two sets of problems:

**Set 1.**

1. Show that the power series representation for \( \frac{1}{1+x} \) is given by \( 1 - x + x^2 - x^3 + x^4 \ldots \), by recalling the summation formula for the geometric series.

2. Use the above problem and a term by term integration to find a power series for \( \ln(1 + x) \).

3. Use the previous problem to find the sum of the alternating harmonic series.

**Set 2.**

1. Use problem 1 in the first set above to find a power series representation for \( \frac{1}{1+x^2} \).

2. Use the previous problem and a term by term integration to find a power series for \( \tan^{-1} x \).

3. Use the previous problem to obtain a series which converges to \( \pi \).

*Each set is worth a total of 10 points.*