

1. (16 points) Determine whether each of the following series is absolutely convergent, conditionally convergent, or divergent. For this problem, and all subsequent problems, explain your work and name any test or theorem that you use.

(a)  $\sum_{n=2}^{\infty} \frac{1}{2^n} n^3$

(b)  $\sum_{n=1}^{\infty} \frac{n+2}{n^3+5}$

2. (12 points) Use the Maclaurin series for  $\ln(1+x)$  and  $\ln(1-x)$  to find the Maclaurin series for  $\ln \frac{1+x}{1-x}$ . Write your answer using sigma notation and include the radius of convergence. (*Hint: Write out the first few terms of the  $\ln(1+x)$  and  $\ln(1-x)$  series.*)

3. (18 points)

(a) Find a series representation for  $\int_0^1 e^{-x^3} dx$ .

- (b) Use the Alternating Series Estimation Theorem to approximate