

Math 253 Lesson 13 - Alternating Series Test

1. Prove the Alternating Series Test.

2. Use the AST to determine whether the following series converge or diverge.

a.
$$\sum_{n=1}^{\infty} (-1)^{n-1} \frac{n^3}{e^n + 1}$$

b.
$$\sum_{n=0}^{\infty} (-1)^n \frac{2 \cdot 2^n - 3}{2^n + 5}$$

3. Approximate $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^5}$ within an accuracy of 0.0001 as per the AST.

4. Use a known power series to determine the power series for $f(x) = x \tan^{-1}(3x)$ by building it up. Then determine the interval of convergence for the power series.

5. Use Taylor's formula to determine the power series for $f(x) = \frac{1}{x}$ centered at $x = 1$ and then determine the interval of convergence for the power series.