

Mathematics 2000: Assignment #3, Winter 2004

Due Feb 4

A professor had a file with convergent series and another file with divergent series. Accidentally the files were mixed up. Please, help the professor to sort things out.

1. Usint the integral test.

a) $\sum_{n=1}^{\infty} \frac{1}{n^4}$

b) $\sum_{n=1}^{\infty} \frac{1}{n^{1/4}}$

c) $\sum_{n=1}^{\infty} \frac{n^2}{n^3 + 1}$

d) $\sum_{n=2}^{\infty} \frac{1}{n \ln n}$

e) $\sum_{n=2}^{\infty} \frac{1}{n(\ln n)^2}$

f) $\sum_{n=2}^{\infty} \frac{\ln n}{n^2}$

2 Using the comparison tests

a) $\sum_{n=1}^{\infty} \frac{n^{3/2}}{n^4 + n + 1}$

b) $\sum_{n=1}^{\infty} \frac{1}{(n^2 + n + 2)^{1/4}}$

c) $\sum_{n=1}^{\infty} \frac{\sqrt{n^2 - n + 7}}{n^3 + n^2 - 125n + 678}$

d) $\sum_{n=1}^{\infty} \frac{1 + \sin^2 n}{2^n}$

e) $\sum_{n=1}^{\infty} \tan\left(\frac{1}{n}\right)$

f) $\sum_{n=1}^{\infty} \cot\left(\frac{1}{n^2}\right)$

g) $\sum_{n=1}^{\infty} \frac{5^n}{3^n + 4}$

h) $\sum_{n=1}^{\infty} \frac{3^n}{4^n + 4}$

i) $\sum_{n=1}^{\infty} \frac{2^n + 3^{n/2} + 2^{2n}}{4^n}$

j) $\sum_{n=1}^{\infty} \frac{(n+1)!}{(n+2)!}$

k) $\sum_{n=1}^{\infty} \frac{n!}{(n+2)!}$

l) $\sum_{n=1}^{\infty} \frac{n}{n!}$

3. Using the alternating series test.

a) $\sum_{n=1}^{\infty} (-1)^n \frac{n^2}{n^3 + 4}$

b) $\sum_{n=2}^{\infty} (-1)^n \frac{n}{\ln n}$

c) $\sum_{n=1}^{\infty} (-1)^n \tan\left(\frac{1}{n}\right)$

d) $\sum_{n=1}^{\infty} (-1)^n \cot\left(\frac{1}{n}\right)$

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

f) $\sum_{n=1}^{\infty} (-1)^n \frac{n^n}{n!}$

Bonus problem Are the following series convergent or divergent?

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

b) $\sum_{n=2}^{\infty} \frac{1}{n(\ln n)(\ln \ln n)(\ln \ln \ln n)(\ln \ln \ln \ln n)}$

c) $\sum_{n=2}^{\infty} \frac{1}{n(\ln n)(\ln \ln n)(\ln \ln \ln n)(\ln \ln \ln \ln n) \dots (\ln \ln \dots \ln n)}$