

## HOMEWORK 8 - MATH 152

DUE DATE: Monday, November 29

INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. One part of each homework problem will be chosen at random and graded. Each question is worth 1 point. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Use the limit comparison test to determine whether the series converges:

$$(a) \sum_{k=1}^{\infty} \frac{1}{9k+6} \quad (b) \sum_{k=1}^{\infty} \frac{1}{(2k+3)^{17}}$$

2. Use the ratio test to determine whether the series converges. If the test is inconclusive then say so.

$$(a) \sum_{k=1}^{\infty} \frac{4^k}{k^2} \quad (b) \sum_{k=1}^{\infty} k \left(\frac{1}{2}\right)^k \quad (c) \sum_{k=1}^{\infty} \frac{k}{k^2+1}$$

3. Use the root test to determine whether the series converges. If the test is inconclusive then say so.

$$(a) \sum_{k=1}^{\infty} \left(\frac{3k+2}{2k-1}\right)^k \quad (b) \sum_{k=1}^{\infty} \left(\frac{k}{100}\right)^k \quad (c) \sum_{k=1}^{\infty} (1-e^{-k})^k$$

4. Use any method that you find appropriate to determine whether the series converges:

$$(a) \sum_{k=1}^{\infty} \frac{k^2}{k^3+1} \quad (b) \sum_{k=1}^{\infty} \frac{4}{2+3^k k} \quad (c) \sum_{k=1}^{\infty} \frac{4+|\cos k|}{k^3}$$

$$(d) \sum_{k=1}^{\infty} \left(\frac{k}{k+1}\right)^{k^2} \quad (e) \sum_{k=1}^{\infty} \frac{5^k+k}{k!+3}$$

5. Show that  $\ln x < \sqrt{x}$  if  $x > 0$ , and use this result to investigate the convergence of

$$(a) \sum_{k=1}^{\infty} \frac{\ln k}{k^2} \quad (b) \sum_{k=2}^{\infty} \frac{1}{(\ln k)^2}$$

6. Determine whether the alternating series converges and justify your answer.

$$(a) \sum_{k=1}^{\infty} (-1)^{k+1} \frac{k+1}{\sqrt{k+1}} \quad (b) \sum_{k=1}^{\infty} (-1)^k \frac{\ln k}{k}$$

7. Use the ratio test for absolute convergence to determine whether the series converges or diverges. If the test is inconclusive, then say so.

$$(a) \sum_{k=1}^{\infty} (-1)^{k+1} \frac{2^k}{k!} \quad (b) \sum_{k=1}^{\infty} (-1)^k \frac{k}{5^k} \quad (c) \sum_{k=1}^{\infty} (-1)^{k+1} \frac{k^k}{k!}$$

8. Classify the following series as absolutely convergent, conditionally convergent or divergent.

$$(a) \sum_{k=1}^{\infty} \frac{(-1)^{k+1}}{k^{4/3}} \quad (b) \sum_{k=3}^{\infty} \frac{(-1)^k \ln k}{k}$$
$$(c) \sum_{k=1}^{\infty} (-1)^{k+1} \frac{3^{2k-1}}{k^2 + 1} \quad (d) \sum_{k=2}^{\infty} \frac{(-1)^k (k^2 + 1)}{k^3 + 2}$$