

# CSD2201/CSD2200 Week 11 Tutorial Problems

6th November – 12th November 2023

It is recommended to treat the attempt of these problems seriously, even though they are not graded. You may refer to the lecture slides if you are unsure of any concepts.

After attempting each problem, think about what you have learned from the attempt as a means of consolidating what you have learned.

**Note:** These are the following things that should be given in an explanation:

- If you are using a convergence/divergence test, make sure that the series **satisfies the conditions** of the test, e.g. Divergence Test for  $\sum a_n$  must first satisfy  $\lim_{n \rightarrow \infty} a_n \neq 0$ , or in a  $p$ -series,  $p > 1$  implies convergence or  $p \leq 1$  implies divergence.
- Write out the conditions of the test **systematically** (why these conditions are satisfied) and conclude **properly**. Never assume that the grader knows exactly what you are thinking.

## Question 1

Determine if the following series is convergent. If they are, give an explanation why. If in addition, the series is a convergent geometric series, find their sum.

- (a)  $\sum_{n=1}^{\infty} \frac{2}{n^2}$       (b)  $\sum_{n=1}^{\infty} (-5)^n$       (c)  $\sum_{n=1}^{\infty} \frac{3}{\sqrt[4]{n}}$       (d)  $\sum_{n=1}^{\infty} \frac{n^2 + n}{n^3 + 2}$
- (e)  $\sum_{n=0}^{\infty} 2^{4n} 5^{2-2n}$       (f)  $\sum_{n=2}^{\infty} \frac{2}{3^{n-1}}$       (g)  $\sum_{n=3}^{\infty} \frac{5^{2n-2}}{4^{3n-3}}$       (h)  $\sum_{n=1}^{\infty} \frac{2}{n^2 + 4n + 3}$
- (i)  $\sum_{n=1}^{\infty} \frac{n}{n^2 - 3}$       (j)  $\sum_{n=1}^{\infty} \frac{n(n+2)}{(n+3)^2}$       (k)  $\sum_{n=1}^{\infty} \left( \frac{3}{5^n} + \frac{1}{n} \right)$       (l)  $\sum_{n=3}^{\infty} \frac{n^2}{n^3 - 16}$
- (m)  $\sum_{n=3}^{\infty} \frac{1}{n^2 - 8}$       (n)  $\sum_{n=1}^{\infty} \frac{n^2}{n^3 + 23}$       (o)  $\sum_{n=3}^{\infty} 4^{4n-2} 3^{4-2n}$

**Final Answers** (C means convergent, D means divergent):

Q1: (a) C, (b) D, (c) D, (d) D, (e) C;  $\frac{625}{9}$ , (f) C; 1, (g) C;  $\frac{625}{2496}$ , (h) C, (i) D, (j) D,  
(k) D, (l) D, (m) C, (n) D, (o) D.