CSD2201/CSD2200 Week 13 Tutorial Problems

20th November – 26th 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.

The problems here will be used in conjunction with last week's tutorial problems.

Question 1

Find the Maclaurin series for $f(x) = \dfrac{1}{1-x}$ and find its radius of convergence.

Question 2

Find the Maclaurin series for $f(x) = \cos x$ and find its radius of convergence.

Question 3

Find the Taylor series for f centered at $a = 3$ if

$$f^{(n)}(3) = \frac{(-1)^n n!}{5^n(n+2)}.$$

Find the radius of convergence of this Taylor series.

Question 4

Find the Taylor series for f centered at $a = 2$ if

$$f^{(n)}(2) = \frac{(2n)!}{9^n n!}.$$

Find the radius of convergence of this Taylor series.

Final Answers:

Q1: $\sum_{n=0}^{\infty} x^n$, $R = 1$.

Q2: $\sum_{n=0}^{\infty} (-1)^n \frac{x^{2n}}{(2n)!}$, $R = \infty$.

Q3: $\sum_{n=0}^{\infty} \frac{(-1)^n}{5^n(n+2)}(x-3)^n$, $R = 5$.

Q4: $\sum_{n=0}^{\infty} \frac{(2n)!}{9^n(n!)^2}(x-2)^n$, $R = \frac{9}{4}$.