

King Saud University, Department of Mathematics
First Midterm Exam, S1, 2024/25
M-205

All questions carry equal Marks (5 Marks)
Marks: 25, Time: 90 minutes

1. Determine whether the sequences

$\{\ln(2n^2 + 1) - \ln(n^2 + 1)\}_{n=1}^{\infty}$
converges or not. If it converges, find its limit.

2. Test the convergence or divergence of the series

$$\sum_{n=1}^{\infty} \left(\frac{3^{n+2}}{5^n} + \frac{1}{n(n+1)} \right)$$

And find its sum if it converges.

3. Determine whether the following series

$$\sum_{n=1}^{\infty} ne^{-n^2}$$

is convergent, or divergent.

4. Find the radius and the interval of convergence of the power series

$$\sum_{n=1}^{\infty} \frac{x^n}{n2^n}$$

5. Using the first three non-zero terms of the power series.

Approximate the value of the integral

$$\int_0^{0.1} e^{-x^2} dx$$