KING SAUD UNIVERSITY COLLEGE OF SCIENCE M203 DEPARTMENT OF MATHEMATICS TIME: 90 Minutes

(SEMESTER 1, 1441) First Mid-term Exam

Note: All questions carry equal Marks.

Q1. Determine whether the sequence $\{\sqrt{n^4 + 4n^2} - n^2\}$ converges or diverges and if it converges, find its limit.

Q2. Find the sum of the series: $\sum_{n=3}^{\infty} \left[\frac{2^{3n}}{3^{2n}} + \frac{1}{n^2 - 3n + 2} \right]$.

Q3. Determine whether the following series is absolutely convergent, conditionally convergent or divergent: $\sum_{n=2}^{\infty} \frac{(-1)^n}{n \ln(n)}.$

Q4. Find the interval of convergence and the radius of convergence of the power series:

$$\sum_{n=1}^{\infty} \frac{2^n (x-e)^n}{n}.$$

Q5. Find the MacLaurin series for the function $f(x) = \tan^{-1}(x)$ up to three non-zero terms and approximate the value of the integral

$$\int_0^{0.1} \tan^{-1}(x^2) dx$$
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