Department of Mathematics
College of Sciences
King Saud University, Riyadh.

M-203 (Differential and Integral Calculus)
1st MidTerm Examination (2nd semester 1445) (2023/2024),
Time: **90 Minutes**   Max. Marks: 25.
Note: **All questions carry equal marks.**

Q1. Determine whether the sequence $\left\{ \left(\dfrac{n^2 - 2}{n^2 + 3} \right)^n \right\}$ converges or diverges, and if it converges find its limit.

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

Q3. Test the convergence of the series $\displaystyle\sum_{n=1}^{\infty} \frac{3 + \cos(n)}{e^n}$.

Q4. Find the interval of convergence and the radius of convergence of the power series: $\displaystyle\sum_{n=1}^{\infty} \frac{(x+2)^n}{n(-5)^n}$.

Q5. Find the power series representation for the function $f(x) = \dfrac{x}{(1+x)^2}$ and by using its first three nonzero terms approximate the integral $\displaystyle\int_0^1 \frac{x^2}{(1+x^2)^2}dx$.