

**MID TERM I EXAM., SEM. I: 1433-1434**  
**Department of Mathematics**  
**King Saud University**  
**MATH: 203 Time: 90 Minutes Max. Marks: 25**

**Question # 1. [Marks: 4]**

Determine whether or not the sequence  $\left\{\left(1 + \frac{2}{n}\right)^n\right\}$  converges, and if it converges, find its limit.

**Question # 2. [Marks: 4]**

Find the sum of the series

$$\sum_{n=1}^{\infty} \left[ \frac{1}{2^n} + \frac{1}{4^n} \right].$$

**Question # 3. [Marks: 4]**

Determine whether the series

$$\sum_{n=2}^{\infty} (-1)^n \frac{1}{n \ln(n)}$$

converges absolutely, converges conditionally or diverges.

**Question # 4. [Marks: 5]**

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

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

**Question # 5. [Marks: 4]**

Find the power series representation of

$$f(x) = \frac{1}{1+x^3}, |x| < 1,$$

and use it to approximate the integral  $\int_0^{0.5} \frac{1}{1+x^3} dx$  to four decimal places (use two non-zero terms.)

**Question # 6. [Marks: 4]**

Find Taylor series for  $f(x) = \sin x$  centered at  $x = \frac{\pi}{3}$  (write four non-zero terms.)