King Saud University
Department of Mathematics

1 Mid Term Exam **280-Math** **2 Semester (1438/1439)**

Question 1(6). Determine the sup, max, inf and min of the following sets:

$$A=\left\{\frac{1}{3^{\frac{x}{2}}+3^{\frac{2}{x}}}\ ,\ x>0\ ,\ x\in\Re\right\}$$

$$B=\left\{\frac{2n}{n+1}+\frac{1}{2n}+\frac{1}{2}\ ,\ n\in\mathbb{N}\right\}$$

Question2 (6).

a) Decide whether the sequence $x_n=\left(\frac{e}{3}\right)^n+\frac{3n+1}{2n+1}$ is bounded.

b) Which of the following two sequences is Cauchy: $a_n=\frac{n^2+1}{n^2}$ and $b_n=n^2+\frac{1}{n^2}$

c) Using the Definition show that $\lim\limits_{n\to\infty}\frac{4n}{5n+2}=\frac{4}{5}$

Question3 (2+2+2+3). Find $\lim\limits_{n\to\infty}x_n$ if,

a) $x_n=(-1)^n\frac{\sqrt{n+\pi}\ \sin\sqrt{n+\pi}}{n}$

b) $x_n=(-1)^{n+1}(1+\frac{1}{n})$

c) $x_n=\frac{2^n+e^n+3^n}{3^n}$

d) $x_n=\frac{n!}{n^n}$

Question4 (2+2). Determine whether the series converges. If so find its sum;

a) $\sum\limits_{n=1}^{\infty}\frac{n^n}{2^n n!}$ b) $\sum\limits_{n=0}^{\infty}\frac{e^{n+1}}{\pi^{n-1}}$