King Fahd University of Petroleum & Minerals
Department of Mathematics & Statistics
Instructor: Khaled Furati

MATH 411 - Exam 1 - Term 142

Duration: 120 minutes

Student Name:

---

1. Define the following.
   (a) Homeomorphism.
   (b) Interior point of $\Omega \subseteq \mathbb{R}^n$ and the interior of Ω.
2. Show that for any $x \in \mathbb{R}^n$, $\|x\|_\infty \leq \|x\| \leq \sqrt{n}\,\|x\|_\infty$.
3. Prove that if $S \subseteq \mathbb{R}^n$, then $S \subseteq S^{\perp\perp}$.
4. Show that the set of rational numbers Q is neither open nor closed in $\mathbb{R}$.
5. Let $\{x_k\}$ and $\{y_k\}$ be two sequences in $\mathbb{R}^n$ with $x_k \to x$ and $y_k \to y$, where $x, y \in \mathbb{R}^n$. Prove that $\langle x_k, y_k\rangle \to \langle x, y\rangle$.
6. Let $f : \mathbb{R}^n \to \mathbb{R}^m$ be a function. Show that $f(f^{-1}(B) \subseteq B$ for any $B \subseteq \mathbb{R}^m$.
7. Let
$$f(x,y) = \begin{cases} x\cos(1/y), & y \neq 0, \\ 0, & y = 0. \end{cases}$$
Show that f is continuous at $(0,0)$.

Question Number	**Points**	**Maximum Points**
1		10
2		10
3		10
4		10
5		10
6		10
7		10
Total		70