MATH 4360 MIDTERM II

INSTRUCTOR: DAVID MILOVICH

Name: ______________________________

Date: Tuesday, October 19, 2010.

Exercise	Point Possible	Score
1	42	
2	15	
3	28	
4	15	
Total	100	

1. [42 points] Fill in each blank with "A," "B," "C," or "D" as appropriate.

Let $X_1 = \mathbb{R}$ with the standard topology. $[2,3)$ is ________________ in X_1.
A) open, but not closed B) closed, but not open C) open and closed D) neither open nor closed

Let $X_2 = \mathbb{R}$ with the discrete topology. $[2,3)$ is ________________ in X_2.
A) open, but not closed B) closed, but not open C) open and closed D) neither open nor closed

Let $X_3 = [2,4]$ with the subspace topology from X_1. $[2,3)$ is ________________ in X_3.
A) open, but not closed B) closed, but not open C) open and closed D) neither open nor closed

Let $X_4 = [1,3)$ with the subspace topology from X_1. $[2,3)$ is ________________ in X_4.
A) open, but not closed B) closed, but not open C) open and closed D) neither open nor closed

Let $X_5 = [1,3) \cup [4,5]$ with the subspace topology from X_1. $[2,3)$ is ________________ in X_5.
A) open, but not closed B) closed, but not open C) open and closed D) neither open nor closed

Let $X_6 = [1,3) \cup [4,5]$ with the order topology. $[2,3)$ is ________________ in X_6.
A) open, but not closed B) closed, but not open C) open and closed D) neither open nor closed

2. [15 points] Let $X = \{1, 2\}$ with the topology $\mathcal{T}_X = \{\varnothing, \{1\}, \{1, 2\}\}$. Let $Y = \{3, 4\}$ with the topology $\mathcal{T}_Y = \{\varnothing, \{3\}, \{4\}, \{3, 4\}\}$. Give an example of a basis $\mathcal{B}$ for the product topology on $X \times Y$. Explicitly list the elements of your example $\mathcal{B}$.

3. [28 points] Let $X = \{1, 2, 3\} \times (\{0\} \cup \mathbb{Z}_+)$.

(a) Prove that X is countable.
(b) Prove that X with the dictionary order is well-ordered.

(You may assume that $\mathbb{Z}_+$ is countable and well-ordered.)

4. [15 points] Give an example of a 6-element topology $\mathcal{T} = \{U_1, U_2, U_3, U_4, U_5, U_6\}$ on the set $X = \{1, 2, 3\}$. Explicitly list the elements of your example $\mathcal{T}$.