Name: _____

Math 236 Exam 2

- Print your name clearly in the space provided.
- You may use your textbook and class notes only.
- You may not consult with anyone other than me.

Question	Points	Score
1	15	
2	15	
3	10	
4	12	
5	10	
6	18	
7	10	
8	10	
Total:	100	

Honor Statement:

I have neither given nor received help on this exam, and all of the answers are my own.

_____

Signature

1. [15 points] Prove or give a counter-example: Let $n \geq 3$. If G is a connected graph which is not complete such that $\chi(G) = n$, then there exists a vertex $v \in V(G)$ such that $\deg(v) = n$.

2. [15 points] Show that $\frac{1}{2!} + \frac{2}{3!} + \ldots + \frac{n}{(n+1)!} = 1 - \frac{1}{(n+1)!}$.

3. [10 points] Show that $K_{3,3}$ is not planar.

4. [12 points] Define $\sim$ on $\mathbb{R} \times \mathbb{R}$ by $(x, y) \sim (z, w)$ if and only if $|x - y| \sim |z - w|$. Show that $\sim$ is an equivalence relation on $\mathbb{R} \times \mathbb{R}$.

5. [10 points] Let $\sim$ be an antisymmetric relation on the set A and $x, y \in A$. Prove that if $x \sim y$ and $x \neq y$, then $y \not\sim x$.

6. [18 points] Prove that $5^n + 5 < 5^{n+1}$ for all $n \in \mathbb{N}$.

7. [10 points] Let $C = \{i, -1, -i, 1\}$ where $i^2 = -1$. The relation $\sim$ on C given by $x \sim y$ if and only if $xy = \pm 1$ is an equivalence relation. Give the partition of C associated with $\sim$.

8. [10 points] Find and prove a formula to determine the value exact value of the sum $1 - 2 + 3 - 4 + \ldots + (2n - 1) - 2n$.