Quiz 3 - Take home - Due Wednesday, June 3, 2015 **NAME:** ______________________

To receive credit you MUST SHOW ALL YOUR WORK.

1. (10 pts) (a) Assuming the pattern continues, find the next two terms of the sequence and give a formula for the general term a_n.

$$a_0 = 5,\ a_1 = 9,\ a_2 = 13,\ a_3 = 17,\ a_4 = 21,\ a_5 = \underline{\qquad},\ a_6 = \underline{\qquad},\ \ldots,\ a_n = \underline{\qquad\qquad},\ \ldots$$

(b) Assuming the pattern continues, find the next two terms of the sequence and give a formula for the general term a_n.

$$a_1 = \frac{1}{2},\ a_2 = \frac{1}{6},\ a_3 = \frac{1}{12},\ a_4 = \frac{1}{20},\ a_5 = \underline{\qquad},\ a_6 = \underline{\qquad},\ \ldots,\ a_n = \underline{\qquad\qquad},\ \ldots$$

2. (15 pts) (a) Let $\mathcal{S}_n$ denote the set of all bit strings of length n. List all the elements in $\mathcal{S}_3$. What is $|S_3| =$? What is $|\mathcal{S}_n| =$?

(b) Let $\mathcal{S}^f$ denote the set of all bit strings of finite length. Show that $\mathcal{S}^f$ is infinitely countable. (Hint: What's the relation between $\mathcal{S}^f$ and the $\mathcal{S}_n$'s?)

(c) Now let $\mathcal{S}$ denote the set all bit strings of **infinite** length. Show that $\mathcal{S}$ is not countable. (Hint: Use contradiction and Cantor diagonal argument.)