14:332:312 Discrete Math

Homework Assignment 3 (100 points)

Due March 24 start of class

1) *(16 points)* Let A = {a, b, c}, B = {x, y}, and C = {0, 1}. Find
a) A x B x C. b) C x B x A.
c) C x A x B. d) B x B x B.

2) *(15 points)* Draw the Venn diagrams for each of these combinations of the sets A, B, and C.
a) $A \cap (B \cup C)$ b) $A \cap B \cap C$
c) $(A - B) \cup (A - C) \cup (B - C)$

3) *(20 points)*
Let S = {−1, 0, 2, 4, 7}. Find f (S) if
a) f (x) = 1. b) f (x) = 2x + 1.
c) f (x) = $\lceil x/5 \rceil$ d) f (x)= $\lfloor (x^2 + 1)/3 \rfloor$

4) *(20 points)* Show that the sequence $\{a_n\}$ is a solution of the recurrence relation $a_n = -3a_{n-1} + 4a_{n-2}$ if
a) $a_n = 0$. b) $a_n = 1$.
c) $a_n = (-4)^n$. d) $a_n = 2(-4)^n + 3$.

5) *(16 points)* An employee joined a company in 2009 with a starting salary of $50,000. Every year this employee receives a raise of $1000 plus 4% of the salary of the previous year.
   a) Set up a recurrence relation for the salary of this employee n years after 2009.
   b) What will the salary of this employee be in 2017?
   c) Find an explicit formula for the salary of this employee n years after 2009.

6) *(13 points)* Show that the set of real numbers that are solutions of quadratic equations $ax^2 + bx + c = 0$, where a, b, and c are integers, is countable.