Discrete Math Homework 6
Due Wednesday, February 22 at the beginning of class

General instructions:

- Use standard size paper (8.5 by 11).
- Answer each question in order using a single column.
- Be neat. If we cannot read your solution it is wrong.
- Show your work. If you just write an answer, you will get minimal credit even if the answer is correct.

Rosen section 1.8.

Question A) Show that $n^4 + 2n^3 + n^2$ is divisible by 4 for all integer n.

Hint: Note that a number x is divisible by 4 iff xmod4=0.
Do a proof by cases for each of the possible values of nmod4.
Remember our rules for mods:

$$(x + y) \bmod m = (x \bmod m + y \bmod m) \bmod m$$

$$(x \cdot y) \bmod m = ((x \bmod m) \cdot (y \bmod m)) \bmod m$$

You can look at home work 5 solutions to see manipulations of mods.

Question B) Rosen 1.8 Exercise 10 (p. 108) Hint: Think about the spacing of perfect squares.

Rosen section 2.1.

Question C) Rosen 2.1 Exercise 6 (p. 125)

Question D) Rosen 2.1 Exercise 10 (p. 125)

Question E) Rosen 2.1 Exercise 20 (p. 126)

Question F) Suppose that $A_n = \{1,2,3,\cdots n\}$ and $B = \{true, false\}$. What are the following?

a) $A_2 \times B$
b) $P(B)$
c) $|P(A_5)|$
d) $|A_{10} \times A_{20}|$

Rosen section 2.2.

Question G) Rosen 2.2 Exercise 4 (p. 136).

Question H) Rosen 2.2 Exercise 12 (p. 136). (Use a membership table.)

Question I) Rosen 2.2 Exercise 24 (p. 136).

Question J) Rosen 2.2 Exercise 34 and Exercise 35 (p. 137). (Use Venn diagrams)

You may choose to solve one (and only one) of the following Extra Credit Problems. If you submit more than one, only the first will be graded.

Extra Credit 1) Rosen 1.8 Exercise 38 (p. 109)
Extra Credit 2) Rosen 1.8 Exercise 46 (p. 109) (See p. 103 for definition of domino and checkerboard coloring)
Extra Credit 3) Rosen 2.2 Exercise 40 (p. 137)