Homework 4

Submission Information: This assignment is due, on paper, within the first 10 minutes of class on **Wednesday, December 2**. Please type or write ***NEATLY***; submissions that cannot be read will **NOT** be graded! Be sure to include your name and SBU ID # on **ALL** pages that you submit.

This assignment consists of 5 questions, and is worth a total of 15 points.

1. Classify each of the following algorithms as linear, polynomial (but slower than linear), or exponential. Consider the algorithmic growth relative to N: as N grows, how does the algorithm's time requirements grow? (3 points)

    1. Surveying N people in a room to find out the political affiliation of each.

    2. Recording each score for a round-robin tournament of N teams (in a round-robin tournament, each team must play against every other team)

    3. Counting how many credit cards (in a collection of N credit cards) have a negative balance.

2. A particular Turing Machine is defined by the following set of rules:

    (1, 1, 1, 2, L)
    (2, b, 0, 3, L)
    (3, b, 1, 4, R)
    (4, 0, 1, 5, R)

    Describe how this Turing Machine will behave on the tape ... b 1 b ...

    That is, the tape consists of a single 1 with an infinite number of blanks on each side. You may assume that the machine starts in state 1, with the read/write head positioned over the (single) 1. (3 points)

3. Translate the following bit pattern into (base 10) numeric dotted-quad IP address (be sure to show your work!). Use your Web browser to find out where this address leads. What Web site does this address correspond to? (3 points)

    00010111 01001100 10001011 10010101

4. The table below lists a series of specific mitigation strategies. For each of the threat scenarios described below, list ***all*** of the mitigation strategies below that can significantly improve security. (3 points)

antivirus software	file backup	one-way encryption
callback	firewall	two-way encryption
digital signature	log files	spam filter

1. You work for the United States government and your machine stores highly-classified information. You do not use this computer for e-mail, but it is connected to the Internet. Not only are you expected to maintain the confidentiality of the classified information, it is also expected that anyone attempting an attack on this machine must be caught and prosecuted.

2. You are writing a computer program to store personal identification numbers (PINs) for a company that manufactures automated teller machines (ATMs).

3. You work for a financial company, and your boss frequently e-mails you instructions to make large, expensive stock purchases and sales. If you get the instructions wrong, you could lose your job (and cost the company a lot of money).

5. The *simple checksum* of a number is computed by adding up the digits of the number, and then extracting the rightmost digit of that sum. For example, the simple checksum of 1038 would be 2 (adding the digits gives us 12, the rightmost digit of which is 2). Assume that the `int` variable *n* has been declared and assigned an integer value, and that the `int` variable *checksum* has been declared and initialized to 0. Write some Java code that will compute the simple checksum of *n* and store the result into *checksum*. You may declare any additional variables that you need. **Hint:** A `while` loop and the modulo (%) operator will be *extremely* helpful for this problem! (3 points)