Listed below are the various projects that will be required throughout the semester. Each of these are worth 20 points and will be due the day following the exam for the appropriate chapter. These projects take you above and beyond the material covered in the book or require outside data acquisition. You may work in groups of up to three people per project (with the exception of the first project, which is an individual project). Turn in one project with all group member's names on it. Plan on reading the section of the book dealing with the matter before we cover it in class; you will not always have time to finish the project if you wait until we do.

**Project 1, Chapter 3 - (individual project)**

Your project is to plan a retirement fund for yourself. To simplify calculations, assume all transactions - starting of annuity fund, retirement, and death - occur on your birthday. Assume a nominal interest rate of 6% has been guaranteed for the remainder of your life.

- Identify the age you will be on your birthday this year.
- Identify the age at which you wish to retire. Identify the number of years before retirement.
- Identify the age at which you anticipate dying. Identify the number of years of retirement.
- Identify the monthly payment you anticipate needing during your retirement.
- Calculate the present value necessary on the date of retirement to finance your retirement. The present value needed to retire is the future value necessary upon retirement. Calculate the monthly payment needed before retirement to have enough money to retire.
- Calculate the amount of money in your retirement fund after ten years assuming you make the regular payments just calculated.
- After the ten years, assume that you receive an inheritance of $20,000 and add it to your retirement fund. If you stop making regular payments, and just let what money is in the account draw interest, what will the amount be at the time of retirement?
- Subtract this amount from the future value needed upon retirement and recompute the monthly payment necessary to obtain the future value. Remember that ten years have gone by. If no more monthly payments are needed, then state the monthly benefit when you retire.

**Project 2, Chapter 4**

**Part I (10 points)**

- Work the Chapter 4 Group Activity 1, pages 262-263 in the textbook. Only work parts A and B. Although all of the tables in the book are written as columns, you may need to create the matrices as rows so the multiplication can be performed.

**Part II (10 points)**

**Qwest Communications**

Philip Anschutz bought Southern Pacific in 1990 and within two years spun off SP Telecom as a separate company, which became Qwest. Qwest then evolved from SP Telecom when Anschutz Corporation sold Southern Pacific in 1996 and kept SP Telecom. Originally a construction arm of Southern Pacific, SP Telecom built conduit for carriers along the railroad’s rights-of-way, at the same time installing a spare conduit for itself.

In 1997 Qwest announced that it was building a nationwide fiber-optic network. At that time, the company entered into contracts with Frontier, WorldCom (now MCI WorldCom) and GTE, all of whom agreed to buy fiber installed by Qwest. As a result of these contracts, Qwest’s construction costs of building the network were greatly reduced.

Joseph P. Nacchio joined Qwest in 1997 as president and chief executive officer. Nacchio’s first
major accomplishment was taking the company public that year. On June 27, 1997, Qwest had its Initial Public Offering, followed by third quarter revenue increases of 325 percent. In August 1998, Qwest was named to the Nasdaq-100 index, underscoring the company’s emergence as one of the market’s emerging companies.

They have a map of their Nationwide IP Infrastructure available on their website (hint: choose About Qwest and then the Fiber Network) at http://www.qwest.com/.

For those that are interested, the short history of Qwest above and additional information on Qwest and other national backbone providers can be found at Boardwatch magazine at http://boardwatch.internet.com/.

I have created a blank incidence matrix that you may wish to print and use to make this easier for you. It requires Adobe Acrobat Reader to view.

A “hop” is when a packet travels between two hosts or routers on a network. For example, here’s what happens when someone at Richland requests a packet of information from the University of Illinois in Urbana-Champaign.

```
1 t1.richland.cc.il.us (206.152.201.33)
2 rcc-stl.ccinet.net (206.24.41.229)
3 166.48.72.17 (166.48.72.17)
4 corerouter1.Atlanta.cw.net (204.70.9.142)
5 core4.Atlanta.cw.net (204.70.9.33)
6 ast-bbn2-nap.Atlanta.cw.net (204.70.10.174)
7 h11-0.chicago1-br1.bbnplanet.net (4.0.2.165)
8 p2-3.chicago1-nbr1.bbnplanet.net (4.0.1.205)
9 4.0.5.234 (4.0.5.234)
10 chi1-ds3.uiuc.edu (207.227.0.218)
11 t-exit1.gw.uiuc.edu (128.174.0.226)
12 t-world.gw.uiuc.edu (128.174.1.225)
13 spider.cso.uiuc.edu (128.174.5.27)
```

Technically, a packet will travel through 13 hosts (hops) before getting to UIUC. However, we don’t have the specifics of Qwest’s backbone, so we will look only at the number of cities, rather than the actual number of hosts.

```
1 Decatur (host 1)
2 St. Louis, MO (hosts 2,3)
3 Atlanta, GA (hosts 4,5,6,7)
4 Chicago, IL (hosts 8,9,10)
5 Urbana, IL (hosts 10,11,12,13)
```

So, even though there are 13 individual hosts or routers involved, we will only deal with the five cities involved: Decatur, St. Louis, Atlanta, Chicago, and Urbana. Oh, and you may have just learned something about the Internet. Physical proximity has very little to do with network distance. When we request information from Urbana, it has to go through Atlanta and Chicago before getting there.

When I say “hop” or “network segment”, I mean a trip between two cities as explained above.

☐ Create an incidence matrix for the Qwest national backbone. List the cities in alphabetical order. In the case of multiple connections (such as San Francisco to New York), be sure to count each connection.

☐ What is the maximum number of hops a packet might travel before reaching its destination? (Hint: find \( A + A^2 + A^3 + \ldots \) until every non-diagonal element is greater than zero)

☐ Part of the design of a good network is redundancy. If any one site loses connectivity, the rest of the network must continue to function. If the site at Washington DC goes down, what is the maximum number of hops a packet might travel before reaching its destination (assume its destination isn’t Washington DC)?
Project 3, Chapter 6
John and Mitchy run a computer store. They can purchase 10 computers from Zol and Denny for $2000 each, 30 computers from McGuinn and McGuire for $1800 each, or 50 computers from Sebastian for $1700 each (they can buy from more than one dealer, but only one order per dealer). John and Mitchy sell the computers for $2100 each. Each computer that is left at the end of the month will be sold in a clearance sale for $1300. John and Mitchy estimate a loss of goodwill of $100 for each customer which comes into the store, but is unable to purchase a computer. During the month, the customers will either demand 15, 30, 45, or 60 computers. Assume the probability of 15, 30, 45, or 60 computers is 0.10, 0.15, 0.50, and 0.25 respectively.

- Create a payoff table with the five actions (purchase plans) and four states of nature (demand)
- Create the opportunistic loss (regret) table.
- For each decision criteria (expected value, maximax, maximin, minimax), find the payoff or loss and the best action.

Project 4, Chapter 8

Part I (10 points)
- Work the Chapter 8 Group Activity 1, page 561, in the textbook.

Part II (10 points)
- Create a 4 by 4 non-strictly determined game matrix with no recessive rows or columns.
- Turn the matrix into a story problem. The matrix can be given as a matrix, but come up with choices for the row and column players to make it an interesting problem.
- Solve the game.

Project 5, Chapter 9

Part I (10 points)
- Work the Chapter 9 Group Activity 1, page 610, in the textbook.

Part II (10 points)
- Work the Chapter 9 Group Activity 2, page 611, in the textbook.