NOTE: Problems 1 through 4 are individual problems that require engineering format. Problem 5 and 6 are team problems, although each member of the team should turn in the team’s work with their homework (for a team of 4, all 4 people will turn in a copy of the team’s work). This will make keeping track of individual grades easier.

1. You decide that you are tired of your clunker (which is paid for) even though you are still managing to keep it running – somehow. It’s really a stinking piece of junk. So, you decide to buy a new Infinity FX FX45 AWD for $49,850 plus 8.5% sales tax. If you intend to pay the car off in 60 months, how much will your total out of pocket be for the vehicle (not counting insurance, maintenance differences between your cars, etc.)? Assume you will be paying 9.5% interest compounded monthly. $86,810.58

2. Your company is considering purchasing an $80,000 piece of equipment to reduce labor costs and would like to evaluate two options over a four-year period. Assume an interest rate of 9% compounded annually, and bring all the costs back to the present (determine the present cost). Draw cash flow diagrams for both options, and identify the best option.
   - Option 1: Do not purchase the equipment and continue paying current labor costs of $30,000 per year. $97,191.60
   - Option 2: Purchase the $80,000 piece of equipment and reduce labor costs to $15,000 per year. $111,453.45
     - Maintenance costs for the new piece of equipment are $1,000 for year 1, $1,500 for year 2, $2,500 for year 3, and $5,000 for year 4 (paid out at the end of the year)
     - The salvage value of the equipment is estimated at $35,000 after four years.

3. Compute the present amount for the cash flow below, assuming an annual interest rate of 7% compounded monthly over five years. $24,773.68

4. Compute the future amount for the cash flow below, assuming an annual interest rate of 7% compounded monthly over five years. $35,119.79
5. Email your instructor a brief description of your product using the format below. This description will be printed in the Design Expo Program. Please work on the wording to make it as clear and concise as possible. Try not to make the description longer than the one shown below. Also print out a copy to include with your homework.

<table>
<thead>
<tr>
<th>Project Name: RC Doggie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team Members: Sally Doe, John Deere, Sam Eastwing, Janet Westwing</td>
</tr>
<tr>
<td>Project Description: Dogs are routinely used in search and rescue operations. Many times, the ground area to search is large with terrain that is difficult for humans to pass. Our concept utilizes radio frequency signals transmitted from a command center to a dog (wearing the harness) some distance away to direct the dog in a systematic way. The dog harness is equipped with four vibrating motors placed on the dog’s left and right shoulders, back and neck; when these motors are activated, the dog moves accordingly. The harness is also equipped with a GPS sensor and an RF transmitter to relay the position of the dog back to base which has a corresponding RF receiver. When the dog stops following the commands from the vibrating motors, as determined by a non-changing GPS location, then the search has been successful, and the humans move in to check things out.</td>
</tr>
<tr>
<td>Sensors and Actuators: Two Arduinos, two RF transmitter / receiver pairs (Parallax 433 MHz RF Transceiver Package), five cell phone vibrating motors, one Parallax GPS receiver module</td>
</tr>
</tbody>
</table>

6. Build your third prototype. This prototype should have many of the characteristics of your final product. You should be moving toward incorporating all of your sensors and actuators onto the design. Take a picture of your prototype, include the picture in your homework, and bring your prototype to class.

7. Bring any tools you need to class next time to work on your prototype. You should have about one hour in class to work on the prototype. Be sure to bring your safety glasses.

8. (Due Class 15) As an engineer in a world that is becoming increasingly “flat,” it is very likely that you will work with people from other cultures during your career. Using the Internet and other sources, learn about cultural differences to help you prepare for these future interactions. A good overview of cultural differences is provided at . . .

http://www.professionalroofing.net/past/apr00/international.asp

Pick a country other than your native country and discuss some of the things that you would need to consider when interacting with these people. Write a couple of paragraphs describing what you have learned (about ½ page is fine), and come to class ready to participate in an open discussion on this topic. We expect you to spend about one hour completing this problem; this is not meant to be an exhaustive study of the topic.