Problem Set #1

**Topic 1: Expected Value Maximization and Profit Measurement**

1. Suppose that Wal-Mart Stores, Inc. anticipates that profits over the next six years to be as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Expected Profits (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>$12,179</td>
</tr>
<tr>
<td>2012</td>
<td>$14,288</td>
</tr>
<tr>
<td>2013</td>
<td>$13,977</td>
</tr>
<tr>
<td>2014</td>
<td>$15,608</td>
</tr>
<tr>
<td>2015</td>
<td>$17,411</td>
</tr>
<tr>
<td>2016</td>
<td>$21,238</td>
</tr>
</tbody>
</table>

(a) Calculate the value of Wal-Mart Stores, Inc. today. Assume the discount ratio to be three percent.

(b) Repeat (a), except assume the discount rate to be five percent.

(c) Compare your answers from (a) and (b). Can you draw any conclusions about the value of the firm and the discount rate?
2. Information concerning the financial situation for major corporations in 2007 is given in the following table.

<table>
<thead>
<tr>
<th>COMPANY NAME</th>
<th>SALES REVENUE ($Million)</th>
<th>NET INCOME ($Million)</th>
<th>NET WORTH ($Million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catepillar, Inc.</td>
<td>41,517</td>
<td>3,537</td>
<td>6,863</td>
</tr>
<tr>
<td>Citigroup, Inc.</td>
<td>96,431</td>
<td>21,185</td>
<td>118,856</td>
</tr>
<tr>
<td>DuPont de Nemours</td>
<td>28,982</td>
<td>3,148</td>
<td>9,212</td>
</tr>
<tr>
<td>Intel Corporation</td>
<td>35,382</td>
<td>5,044</td>
<td>36,717</td>
</tr>
<tr>
<td>McDonald’s Corporation</td>
<td>21,586</td>
<td>2,873</td>
<td>15,416</td>
</tr>
<tr>
<td>The Coca-Cola Company</td>
<td>24,088</td>
<td>5,080</td>
<td>16,892</td>
</tr>
<tr>
<td>The Walt Disney Company</td>
<td>35,156</td>
<td>4,341</td>
<td>32,746</td>
</tr>
</tbody>
</table>

(a) Calculate the profit margin for each of these firms.

(b) Calculate the return on equity (ROE) for each of the firms.

(c) In 2007, which firms had the highest and lowest profit margins?

(d) In 2007, which firms had the highest and lowest ROE?

3. How is the popular notion of business profit different from the economic profit concept?
Topic 2. Solve for unknown(s). Find the values of x and y which satisfy each equation(s). Also, check your answer by substitution.

1. \( \frac{2}{5}x = 1 - \frac{x}{2} \)

2. \((3x - 1)(x + 1) = 3x^2\)

3. \(2x + 3y = 2, x - y = 1.5\)

4. \(3x + 2y = 8, x - 2y = 16\)


1. Given the utility function \( U = \ln y \), where \( y \) is income, derive the marginal utility (MU) function. Now, suppose that \( U = 6 + 3y^2 \); derive this marginal utility function. Contrast these utility specifications.

2. Given the profit function \( \pi = -500 + 200Q - 4Q^2 \), where Q corresponds to output, do the following:
   (a) Find that value of Q that maximizes profit.
   (b) How do you know that your value of Q actually maximizes profit?
   (c) What is the maximum value of profit?
3. Suppose that TR = $41.5Q - 1.1Q^2$ and that TC = $150 + 10Q - 0.5Q^2 + 0.02Q^3$.

(a) Derive the marginal cost (MC) function and the average total cost (ATC) function. Plot the MC and AC functions.

(b) Formulate the profit function in terms of Q.

(c) Find the profit-maximizing output.

(d) Find the maximum value of profits.

(e) Check on second-order conditions.

4. 21st Century Insurance offers internet-order automobile insurance to preferred-risk drivers in the Los Angeles area. The company is the low-cost provider of insurance in the market. But, the company believes its $750 annual premium cannot be raised in order to remain competitive. Subsequently, its rates are expected to remain stable, hence \( P = MR = $750 \). The total cost relationship for the company is given as:

\[
TC = 2,500,000 + 500Q + 0.005Q^2,
\]

where \( Q \) corresponds to the number of policies sold.

(a) Calculate the profit-maximizing number of policies sold.

(b) Calculate the company’s optimal profit level.

(c) Calculate the optimal profit as a percentage of sales revenue (profit margin).

5. Problem 2.4, Hirschey (pp.49-50)
Topic 4: Demand Analysis

Given the demand function \( Q = 100 - 10P \), where \( P \) corresponds to price, do the following:

1. Plot the respective demand function. Be sure to label your axes. For what price will \( Q = 0 \)? When \( P = 0 \), what is \( Q \)?

2. Derive the expression for the own-price elasticity. Is the own-price elasticity constant along all points on the demand curve? What price range insures that the demand for \( Q \) is inelastic?

3. Derive the inverse demand function. That is, rewrite the demand function such that \( P = f(Q) \).

4. Problem 2.6, Hirschey (p. 51)