1) Suppose that we have the following observations of consumer behavior:

There are two products available to purchase: Cheeseburgers and Milkshakes

Observation #1: When the price of cheeseburgers was $4 and the price of milkshakes was $2, an individual purchased 5 cheeseburgers and 4 milkshakes.

Observation #2: When the price of cheeseburgers was $3 and the price of milkshakes was $3, an individual purchased 4 cheeseburgers and 5 milkshakes.

Are these two observations consistent with a rational choice?

2) Suppose that the price of good X is $6 and the price of good Y is $2. You have $140 to spend and your preferences over X and Y are defined as

\[ U(x, y) = x^{\frac{3}{4}} y^{\frac{1}{4}} \]

a) Calculate the marginal utility of X (remember, this is the change in utility resulting from a slight increase in consumption of X)
b) Calculate the marginal utility of Y.
c) Calculate the marginal rate of substitution. What does the marginal rate of substitution measure?
d) Suppose that you chose to consume 10 units of X, 40 units of Y. Is this an optimal choice at the current prices? Explain.
e) If the answer to (d) is no, calculate your optimal choice of X and Y.

3) Microeconomics focuses on two primary players: consumers and firms. Both of these players are solving optimization problems.

a) Briefly, explain the problem that each economic players faces.
b) Briefly describe the logic behind the solution process.
c) In what ways are these problems similar? Are there any important differences?

4) Suppose that you have estimated the following demand curve:

\[ Q = 125 - 4.5P + 0.01I \]

Where I represents income and P is price.
a) Suppose that average income is equal to $25,000. Calculate the price elasticity of
demand at $P=65. If you were a revenue maximizing firm, would it be optimal to
charge a price of $65?
b) Suppose that this market is supplied by perfectly competitive firms with a constant
marginal cost of $30 and no fixed costs. Calculate total market sales. Calculate
consumer surplus. What would firm profits be?
c) Now, suppose that, instead, this market was serviced by a monopolist with constant
marginal costs equal to 30 and no fixed costs. Repeat part (b).

5) Suppose that you operate a water park. You have the following demands for your rides.
Rides have a marginal cost of $5.

\[ Q = \begin{cases} 
50 - P, & \text{(Adults)} \\
30 - P, & \text{(Children)} 
\end{cases} \]

a) If you could set different ride prices for adults and children, what would you
charge? What would you charge if you were required to charge everybody the
same ride price?
b) Suppose you could engage in two part pricing (i.e. a price per ride plus an entry
fee. What would you charge for adults and children?
c) Now, suppose that you set menu prices (that is, you sell books of tickets – 1 ticket
per ride). What ticket packages would you sell?

6) What is bundling? Give an example, of how bundling can increase a firms profits. What
characteristics of market demand make bundling desirable?

7) Explain the concept of spatial competition. How can this concept be generalized to talk
about product variety choices?

8) Suppose that you have estimated the following regression (standard errors associated
with each are below in parentheses):

\[ Q_d = 300 - 4P + \varepsilon \]

\[ (6.5) \quad (1.2) \quad (60.5) \]

a) Calculate your forecast at the sample average of $50.
b) Calculate the 95% confidence interval for your forecast.
c) Calculate your estimated demand elasticity at the sample average of $50.
d) Why might you be worried about calculating an estimate of demand at a price of $70?
9) Suppose that you have the following data on heating oil usage:

<table>
<thead>
<tr>
<th>Heating Oil Usage (in Thousands of Barrels)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995Q1</td>
</tr>
<tr>
<td>1995Q2</td>
</tr>
<tr>
<td>1995Q3</td>
</tr>
<tr>
<td>1995Q4</td>
</tr>
<tr>
<td>1996Q1</td>
</tr>
<tr>
<td>1996Q2</td>
</tr>
<tr>
<td>1996Q3</td>
</tr>
<tr>
<td>1996Q4</td>
</tr>
</tbody>
</table>

a) Calculate a forecast for usage in the first quarter of 1999 using a moving average with a length of 4.

b) Repeat (a) using an exponential smoothing model with a smoothing parameter of 0.4 (assume that your forecast for 1998Q4 was 24,500).

c) How would you compare the performance of the methods in (a) and (b)?

d) Why should you be careful to check for the presence of a trend or seasonality before using the methods in (a) and (b)?

10) Suppose that you have the following data:

<table>
<thead>
<tr>
<th>Gasoline Sales (in Thousands of Barrels)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995Q1</td>
</tr>
<tr>
<td>1995Q2</td>
</tr>
<tr>
<td>1995Q3</td>
</tr>
<tr>
<td>1995Q4</td>
</tr>
<tr>
<td>1996Q1</td>
</tr>
<tr>
<td>1996Q2</td>
</tr>
<tr>
<td>1996Q3</td>
</tr>
<tr>
<td>1996Q4</td>
</tr>
</tbody>
</table>

You have already estimated a linear trend as follows:

\[ Q_d = 23,000 + 120t + \epsilon \]

Where \( t = 1 \) refers to 1995Q1.

a) Calculate your forecast for 1999Q1 (\( t = 17 \)).

b) Using the ratio to trend method. Revise your estimate in (a) for seasonality.