1. A firm faces the following demand function:

\[ Q = \begin{cases} 
12 - P & \text{for } 0<P<8 \\
20 - 2P & \text{for } 8<P<10 \\
0 & \text{for } P>10 
\end{cases} \]

a. Graph this demand function. For what value of Q does this function have a kink?
b. What is the firm’s marginal revenue function? Graph this function.
c. Give a plausible reason why a firm’s demand might look like this.

2. Suppose we have a duopoly in the production of mineral spring water. Each firm has the same cost structure where \( MC(Q) = 10 \). The market demand for mineral spring water is given by:

\[ P = 70 - \frac{Q}{50} \]

Each firm, wishing to maximize profits, assumes that the other firm will not change his current level of production. What will be the final level of production for the market (after a Cournot equilibrium is reached)? How much is produced by each firm? How much profit is earned by each firm?

3. If we had efficiency in the duopoly described in question 2, what would the market quantity and price be? How does this compare to your answer for question 2?

4. Suppose the two firms in question 2 collude to maximize joint profits. What would the equilibrium price and quantity be? How much profit is made in the industry and by each firm? (You can assume that the two firms evenly divide production.) How do the profits earned in question 2 compare to those earned in question 4? What does this say about cartel behavior?

5. Suppose that for the 2 firms from question 2, Firm 1 can choose its output first, and then Firm 2 chooses its output level. How much will each firm produce? What is the total industry output? How much profit do each of the firms earn? Is there an advantage to choosing your output first?
6. Suppose that you are on the board of directors of a firm which is the dominant firm in the industry. That is, it lets all of the other firms, which are much smaller, sell all they want at the existing market price. In other words the smaller firms act like perfect competitors. Your firm, on the other hand, sets the market price, which the other firms accept. The demand curve for your industry’s product is

\[ P = 300 - Q \]

where \( P \) is the product’s price and \( Q \) is the total quantity demanded. The total amount supplied by the other firms is equal to \( Q_R \) where

\[ Q_R = 49P. \]

If your firm’s marginal cost curve is given by

\[ MC = 2.96Q_L \]

where \( Q_L \) is the output of your firm, at what output level should you operate to maximize profit? What price should you charge? How much will the industry as a whole produce?

7. Use the following one-shot, normal-form game to answer the questions below:

<table>
<thead>
<tr>
<th>Player 2</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100, 125</td>
<td>300, 250</td>
<td>200, 100</td>
</tr>
<tr>
<td>B</td>
<td>250, 0</td>
<td>500, 500</td>
<td>750, 400</td>
</tr>
<tr>
<td>C</td>
<td>0, -100</td>
<td>400, 300</td>
<td>-100, 350</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Player 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
</tbody>
</table>

a. Find each player’s dominant strategy, if one exists.
b. Find each player’s secure strategy.
c. Find the Nash equilibrium.

8. You are the manager of a firm that manufactures front and rear windshields for the automobile industry. Due to economies of scale in the industry, entry by new firms is not profitable. Daimler Chrysler has asked your company and your only rival to simultaneously submit a price quote for supplying 100,000 front and rear windshields for its new Jeep Liberty. If both you and your rival submit a low price, each firm supplies 50,000 front and rear windshields and earns zero profit. If one firm submits a low price and the other firm submits a high price, the low-price firm supplies 100,000 front and rear windshields and earns a profit of $9 million and the high-price firm supplies no front and rear windshields and earns a loss of $1 million. If both firms quote a high price, each firm supplies 50,000 front and rear windshields and earns a $7 million profit. Determine your optimal pricing strategy if you and your rival believe the new Jeep is a “special edition” that will be sold for one year only. Would your answer differ if you and your rival were required to resubmit price quotes year after year and if, in any given year, there was a 50% chance that Daimler Chrysler would discontinue the Jeep Liberty? Explain.