Introductory Microeconomics
Homework 8: Imperfect Competition

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1. T/F. A monopoly may arise as a result of strong price competition.
2. T/F. Strategic interactions are irrelevant in oligopoly markets.
3. T/F. In some context, two firms are enough to deliver the competitive outcome.
4. T/F. In Bertrand's competition, firms have a strong incentive to undercut their prices.
5. T/F. Producing a differentiated good increases the degree of competition.
6. Two firms sell an homogeneous good and compete setting the price. They face the following demand. Marginal cost is the same for the two firms MC = 1. Total cost for any of the two firms is $\text{TC}(q) = q$.

$$q_1(p_1, p_2) = \begin{cases} 12 - p_1 & \text{if} \quad p_1 < p_2 \\ \frac{1}{2}(12 - p_1) & \text{if} \quad p_1 = p_2 \\ 0 & \text{if} \quad p_1 > p_2 \end{cases} \qquad q_2(p_1, p_2) = \begin{cases} 0 & \text{if} \quad p_1 < p_2 \\ \frac{1}{2}(12 - p_2) & \text{if} \quad p_1 = p_2 \\ 12 - p_2 & \text{if} \quad p_1 > p_2 \end{cases}$$

   (a) Complete the payoff matrix.

   (b) Find the Nash equilibria.

	$p_2 = 0$	$p_2 = 1$	$p_2 = 2$	$p_2 = 3$
$p_1 = 0$				
$p_1 = 1$				
$p_1 = 2$				
$p_1 = 3$				

7. Continue working with the previous exercise. Now firm 1 has $\text{MC}_1 = 0$ while firm 2 has $\text{MC}_2 = 2$. Repeat (a) and (b). Total costs are $\text{TC}_1 = 0$ and $\text{TC}_2 = 2q_2$.
8. (Hubbard & O'Brien, 2.9) Coca-Cola and Pepsi both spend large amounts on advertising, but would they be better off if they didn't? Their television commercials and online ads are usually not designed to convey new information about their products. Instead, they are designed to capture each other's customers. Construct a payoff matrix using the following hypothetical information:

   - If neither firm advertises, Coca-Cola and Pepsi each earn a profit of \$750 million per year.
   - If both firms advertise, Coca-Cola and Pepsi each earn a profit of \$500 million per year.
   - If Coca-Cola advertises and Pepsi doesn't, Coca-Cola earns a profit of \$900 million, and Pepsi earns a profit of \$400 million.

- If Pepsi advertises and Coca-Cola doesn't, Pepsi earns a profit of \$900 million, and Coca-Cola earns a profit of \$400 million.

Find the NE. Can you relate this game to the prisoners' dilemma?

9. The inverse market demand is $p(Q) = 12 - Q$ where $Q = q_1 + q_2$ is the sum of the quantities produced by two Cournot firms. For simplicity assume both firms have zero total and marginal costs.

   (a) Focus on firm 2. Its marginal revenue is $\text{MR} = 12 - q_1 - 2q_2$. Note it depends on the units firm 1 choose. Solve for the best response of firm 2 to what firm 1 chooses. Plot the best response. Your plot should have q_1 in the horizontal axis and q_2 in the vertical axis.

   (b) Focus on firm 1. Its marginal revenue is $\text{MR} = 12 - 2q_1 - q_2$. Find the best response. Plot it in the same graph.

   (c) What's the Nash equilibrium? Identify it in your graph.

10. Consider the following market $Q_D(p) = 7 - p$. Firms in this market are identical and all have a $\text{TC} = q$ and a $\text{MC} = 1$[1].

	Competitive	Cournot Competition	Monopoly
p			
Total q			
CS			
Total Profits			

   (a) Assume this is a perfectly competitive market. Complete the first column of the table.

   (b) Assume there's only one firm. Complete the third column of the table. The marginal revenue is $\text{MR} = 7 - 2q$.

   (c) Assume there are two identical firms engaging in Cournot competition. The inverse demand is $p = 7 - q_1 - q_2$. Marginal revenue for the firms are given below.

$$\text{MR}_1 = 7 - 2q_1 - q_2 \qquad \text{MR}_2 = 7 - q_1 - 2q_2$$

   Find the Nash equilibrium and complete the second column of the table.

[1] This is the continuation of exercise 10 in Homework 6.