1. Answer “True, False or Uncertain” and defend/explain if not true.

   a) Economists are silly to say that profits are competed away in the long-run in monopolistically competitive firms because no one would bother to stay in the industry if it is not profitable for them to do so.  ANS: False. This has to do with the difference between economic and accounting profits. Economic profits “account” for the opportunity costs of the owners’ entrepreneurial supplied factors of production like time (foregone salary elsewhere), capital, resources, etc., etc. One will have positive accounting profit at zero economic profit, and an entrepreneur could have a very nice healthy imputed income from a perfectly competitive business that has zero economic profit.

   b) Under monopolistic competition, a firm's fixed costs will generally decline with increases in output. ANS: False. By definition fixed costs do not vary with output; no matter what type of industry the firm operates in.

   c) If a monopolistically competitive firm raises its price from the price that maximizes profit (given its demand curve), total revenue will normally be expected to fall. ANS: True. Just like a monopolist, a monopolistically competitive firm will operate on the elastic part of his demand curve. So an increase in price would lead to a decrease in total revenue.

   d) For a monopolistically competitive firm in long-run equilibrium, \( p = mc = lrac \), i.e., zero profits are earned, and \( q \) is allocatively efficient. ANS: False. It is true that for a monopolistically competitive firm in long run equilibrium, \( p = lrac \); consequently, zero profits are earned. However, in long run equilibrium (just as in short-run equilibrium) \( mc = mr < p \); hence \( q \) is not allocatively efficient.

   e) In the long-run, profits must be greater or equal to zero for the monopolistically competitive firm. ANS: False. In the long run, profits are equal to zero for a monopolistically competitive firm (or for the marginal monopolistically competitive firm).

   f) Under perfect competition the industry demand curve is horizontal, whereas under monopolistic competition it is downward sloping. ANS: The industry demand curve in perfectly competitive industries is typically downward sloping. It's the perceived demand curve of the individual competitive firm that's completely elastic, i.e., horizontal. The perceived demand curve for a firm in a monopolistically competitive industry, however, is not horizontal due to the assumption that individual firms produce differentiated products.

   g) Monopolistically competitive firms, in the long-run, are allocatively inefficient, but are productively efficient. ANS: Monopolistically competitive firms are neither productively efficient nor allocatively efficient when left alone to profit maximize.

   h) All monopolists can and do successfully engage in price discrimination. ANS: False. Market power is only one of three necessary ingredients for successful price discrimination. You also need to be able to identify buyers by willingness-to-pay at some level, and you need to be able to prevent re-sale.

   i) If OPEC could include all oil producing countries in their cartel and could strictly enforce price and quantity targets, then the price of gasoline would be unlimited. ANS: Nah. Even a pure
monopolist cannot charge whatever price it wants. It is limited by the demand curve. The cartel would not be making its highest profits it could if it set its price so high that very little would be demanded.

j) The incentive to cheat in a cartel will be greater when the cartel produces a homogeneous good. ANS: False. Cheating is easier when the goods produced by members of the cartel are heterogeneous, since then members of the cartel can attempt to hide their cheating by maintaining the cartel price and cheating on some other non-price dimension of the product, e.g., selling a better quality or grade product, supply better service, etc. With differentiation there is more room for non-price competition and cheating will be more difficult to detect.

k) A member of a cartel has no incentive to violate the rules of the cartel since the cartel equates marginal revenue to marginal cost, thereby maximizing the profit of each member. ANS: False. Joint cartel profit maximization may require side payments since some firms, before these payments, actually get less profit than in the non-cooperative solution. However, the total size of profits is larger with the cartel so the “winners” need to compensate the “losers” and there may be attempts to cheat on this since what you’re doing is illegal to begin with. Also, in general, the output levels of each member of a cartel are restricted such that for the individual firm, marginal revenue is perceived to be greater than marginal cost. Therefore, each member has an individual incentive to increase production and thereby increase profit. (Note: if enough members cheat, the actual price will be much lower than the target price and everybody’s profit will decrease.)

l) Testing for short-run economic profit is a sure-fire way to test for if a firm has a significant amount of market power. ANS: Nah. Short run profits tell us nothing about market power or anything else structurally. Firms in all types of industries can exhibit positive short run economic profit. They do generate signals for entry, however. And then long-run profits will indicate that entry barriers exist.

m) Testing for short-run losses is a sure-fire way to test for the existence of a perfectly competitive firm. ANS: Nah. Short run losses tell us nothing about market power or anything else structurally. Firms in all types of industries can exhibit negative short run economic profit. They do generate signals for exit, however.

n) A firm with NO monopoly power must be perfectly competitive. ANS: False, firms with market power can still end up with zero long run profit. In particular take the case of monopolistic competition. The monopolistically competitive firm has market power (P>mc) but does not have monopoly power (positive long run profit).

o) Testing for productive efficiency is a sure-fire way to test for the existence of a perfectly competitive firm, i.e., if the firm is productively efficient then we know for sure that it must be competitive. ANS: False, it is certainly possible for a monopolist to be productively efficient. Nothing necessarily prevents that from happening.

2. The Chrome Corporation is a monopolistically competitive firm with no fixed costs. Currently, in the short-run, it is producing $x'$ units of output. At $x'$ its marginal revenue equals $4$, its total revenue $21$, and its marginal revenue function is $mr = 10 - 2x$. At $x'$, its short run average total cost is at its
minimum value. Assuming it is maximizing its profit at $x'$, what do each of the following equal.

a) the firm's output level; $x = 3$ because if $mr = 10 - 2x$ and $mr = 4 \Rightarrow 4 = 10 - 2x \Rightarrow x = 3$.
b) the firm's price; $p = 7$ because if $tr = 21$ and $x=3 \Rightarrow p = 7$.
c) the firm's short-run average total costs; $sratc = 4$. Since $sratc$ is at its minimum point, $sratc$ must be equal to $mc$. From profit maximization we know that $mr = mc \Rightarrow mc = 4 \Rightarrow sratc = 4$.
d) the firm's total cost; $tc = 12$ since $tc = atc \times x = 4 \times 3$
e) the firm's marginal cost; $mc = 4$ due to the profit maximization condition that $mr = mc$.
f) the firm's short-run profit; $\Pi = 9$ since $tr = 21$ and $tc = 12$ and profit is their difference.

3.

a) Oligopolists collude in order to increase total cartel profit AND at the same time to increase the profit of each and every individual member of the cartel relative to the non-cooperative solution. They do this by mimicking or acting as one profit-maximizing, multi-plant monopolist. Production quotas are set such that each member of the cartel is producing at the same marginal cost.

b) The game in its "box" form, a.k.a. normal or matrix form.

<table>
<thead>
<tr>
<th>Rest of OPEC (ROO)</th>
<th>IRAQ</th>
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<tbody>
<tr>
<td></td>
<td>low</td>
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<tr>
<td>low</td>
<td>ROO=40, IRAq=10</td>
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<tr>
<td>high</td>
<td>ROO=20, IRAq=3</td>
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c) Looking at the reaction functions note the following. If Iraq produces low, then the rest of OPEC should produce low. If Iraq produces high, the rest of OPEC should produce low. If the rest of OPEC produces low, Iraq should produce high. If the rest of OPEC produces high, Iraq should produce high. Therefore, (ROO\text{\text{\text{\text{low, IRAq\text{\text{\text{\text{high)}}}}} is a Nash equilibrium.}}}}
d) A better outcome for the cartel would be (low, low) since the total payoff associated with that outcome is higher than that associated with the equilibrium outcome: $(40 + 10) = 50 > 45 = (30 + 15)$. In order to ensure this outcome, a contract could be written that would require both Iraq and the rest of OPEC to produce low and would further require the rest of OPEC to give Iraq at least $5, but not more than $10. It is necessary that this contract be enforceable, otherwise, the rest of OPEC could refuse to make the appropriate payment to Iraq.

e) There are several possible reasons that we often see oil selling at prices below the OPEC target price: 1) there are countries that do not belong to OPEC that sell oil, 2) there is undetected cheating, and 3) it is difficult to monitor compliance with output restrictions.

4. Your drawing should like Figure 4.6b in the Carlton&Perloff text, if you assume no entry, where the cartel acts as though it is a dominant firm. If you assume free entry, your drawing should look like Figure 4.7b in the text. If the cartel’s marginal costs are low enough so that it maximizes its profits at a price below the non-cartel members’ shut-down price, the cartel drives the fringe out of business.

5. There is no equilibrium for three firms, even if firms are allowed to locate “on top” of each other. There are three possibilities to consider: (1) If none of the firms occupy the same location, both the leftmost firm, $x$, and the rightmost firm, $z$, want to move as closely as possible to the middle firm, $y$, because they then have to share the smallest segment of the market with $y$. As a result, $y$ is hemmed in on both sides with no customers to sell to, and it therefore wants to move to the left of $x$, to the right of $z$, or to the same location as either of the two. This is therefore not a Nash equilibrium. (2) If exactly two firms, say $x$ and $y$, occupy the same location, then $z$ wants to move as closely as possible to them, on the side with the longest distance to the end of “Main Street.” In that way $z$ gets at least half the market, while $x$ and $y$ each get at most a quarter. Either $x$ or $y$ can then do better by moving right next to $z$ again, on the side with the longest distance to the end of Main Street. This is therefore not a Nash equilibrium either. (3) Finally, if all three firms occupy the same location, they each get a third of the market. Any one of them can then do better by moving slightly to the side with the longest distance to the end of Main Street, thereby getting at least half the market. This is therefore not a Nash equilibrium either.

6. The domestic concentration ratio based on data from only domestic firms is an upper bound on the relevant concentration ratio if the good is also imported. If imports in an industry increase over time, domestic concentration ratios may become less correlated with price-cost margins, because those industries are increasingly competitive.

7. Mr. Smith: $X^S = 10 - P$; Ima: $X^I = 8 - P$. IV's marginal cost is constant and equal to $\$3$ regardless of who he sells a movie to and regardless of how many movies he sells. There are no fixed costs.

a) $X^S = 10 - P$; $X^I = 8 - P$ $\Rightarrow X^\text{sm} = 18 - 2P$ $\Rightarrow P^\text{sm} = 9 - (1/2)X.$

To profit max set $mr = mc$. Note that: $mr = 9 - X$ and that $mc = 3$

$X^\text{sm} = 6; P^\text{sm} = 6; X^S = 4; X^I = 2; \Pi^\text{sm} = 36 - 18 = \$18.$

b) own price elasticity$^\text{Smith} = -(1)(6/4) = -1.5$ own price elasticity$^\text{Ima} = -(1)(6/2) = -3$. Since Ima's demand is relatively more elastic I'd say IV is showing some boring adult type movie.
c) \( m_r^S = 10 - 2X \) setting \( mr = mc \) gives you 10 - 2X = 3 \( \Rightarrow X^S = 3.5 \) and \( P^S = $6.50 \)
\( m_r^I = 8 - 2X \) setting \( mr = mc \) gives you 8 - 2X = 3 \( \Rightarrow X^I = 2.5 \) and \( P^I = $5.50 \)
\( \Pi^IV = 22.75 + 13.75 - 18 = $18.50 \)

d) Now \( m_r^S = 10 - X \) so setting \( mr = mc \) you get: 10 - X = 3 \( \Rightarrow X^S = 7 \) and \( P^S = \{9,8,7,6,5,4,3\} \)
Now \( m_r^I = 8 - X \) so setting \( mr = mc \) you get: 8 - X = 3 \( \Rightarrow X^I = 5 \) and \( P^I = \{7,6,5,4,3\} \)
No dead-weight loss.

e) \( P = $3 \), entry fee\(^S = (\frac{1}{2})(7)(7) = $24.50 \) and entry fee\(^I = (\frac{1}{2})(5)(5) = $12.50 \)
\( X^S = 7; \ X^I = 5. \)
Note: Same outcome as in part (d)

8. As a simple monopolist you sell \( Q = 4 \) units at \( P = $6. \) Profits if do not purchase database and software are:
\[ \Pi = (4*6) - (4*5.50) = 2 \]
If you perfectly price discriminate you sell 5 units and capture the entire net social surplus.
Profits if do purchase database and software: \[ \Pi = \frac{1}{2} *5*5 - 8 = 4.50 \]
Therefore, you should purchase the software.

9. If Polo charges a price at the Syracuse store of \( P_s = 100 \) and a price at the Waterloo store of \( P_w = 85 \), then Type B consumers will buy at Waterloo and Type A consumers will buy at Syracuse. Profits would then be
\[ 2000(100)+1000(85)-3000(10)-\text{fixed costs}=255,000-\text{fixed costs} \]
Maximum profits from having everyone buy from the Syracuse store are when \( P_s = 90 \) so profits are only
\[ 3000(90)-3000(10)-\text{fixed costs}=240,000-\text{fixed costs} \]

10. If the company provides the water bottles for $4 per bottle then:
Type A is willing to pay a maximum membership fee of: entry fee = \( .5*(12-4)*40 = 160 \).
Type B is willing to pay a maximum membership fee of: entry fee = \( .5*(10-4)*30=90 \).
If the entry fee is set at $90, profits are: \( 90*30 + 20*4*30 + 10*4*40 - 2[10*40 + 20*30] - 1000 = 3,700 \)
If the entry fee is set at $160, profits are: \( 160*10 + 10*4*40 - 2*10*40 – 1000 = 1400 \).
Therefore, profits are maximized at $3,700 when the membership fee is $90.