Thought for the Day: This is only a test. If it were a real emergency, none of us would be here.

Instructions: Answer any 6 of the following 8 questions. Each question is worth 6 pts. Missed points will be deducted from a maximum possible score of 36, so it is in your best interest to leave 2 questions blank (no penalty). Good luck.

1. Assume ‘Office Space’ is a variable input used by a business called Global Technologies. Using input pricing concepts (e.g. MRP) when labor was our variable input) discussed in class:

   a. Explain and show with a diagram below factors other than a change in the price or cost of office space that would likely increase the quantity or amount of office space purchased by Global Technologies.

   ![Diagram showing MFC = P = per unit cost, MRP, and Q (office space)]

   → ↑ Demand due to ↑ MRP
due to either:

   1) ↑ P of products sold by firm
   2) ↑ MRP of office space
   [users employed by firm]

   b. Suppose in this firm’s geographical employment market, other companies are expected to be cutting back on their needs for office space. Explain the input pricing implications of this development. Also, discuss some resulting profit-max implications for Global Technologies regarding the future purchases of office space.

   → ↓ mkt D for office space ⇒ likely ↓ P of office space in future

   ⇒ Implications:

   1) Optimal amt. of office space for firm to ↑ ⇒ look to expand
   2) May postpone entering into long-term office space lease agreements in anticipation of better deals later
2. "Potpourri" economics. Answer any 3 of the 4 following sub-questions.

a) Average annual salaries of professional baseball players now exceed $2 million per player. Many professional baseball players have ‘performance’ clauses included in their contracts. Explain what this likely means and how it relates to a ‘principal-agent problem’.

Performance clauses = incentives to do well as an individual player. Likely to be extra or bonus payments for specific accomplishments or producing at a certain level.

In this case, a principal = a team owner, an agent = a player. Without incentives, players may not have as much motivation to win as the owners.

b) Using the concept of MC, explain why we often see people live in the ‘suburbs’ and commute to work ‘downtown’ rather than live in or close to downtown and walk (or drive considerably less) to work.

The marginal (incremental) cost of buying a house in the suburbs is enough lower than living downtown so as to offset the extra commuting costs.

c) What is breakeven output for a price-taking firm that has \( P = 150 \), \( AVC = 100 \), and \( TFC = 100,000 \)?

\[
\pi = TR - TVC - TFC = PQ - AVC(Q) - TFC
\]

\[
\text{Breakeven } \Rightarrow \pi = 0
\]

\[
= 150Q - 100Q - 100,000 = 0
\]

\[
\Rightarrow 50Q = 100,000
\]

\[
\Rightarrow Q = 2000
\]

d) Suppose a company’s demand curve is given by the equation \( P = 60 - 4Q \). If the company wishes to use a ‘two-part’ pricing strategy, what would the company likely do if its MC = 0?

1) Set \( P = MC = 0 \)

2) Change fee = consumer surplus

\[
= \frac{1}{2} (60) (15)
\]

\[
= \$450
\]

(fee = membership or admission fee)
3. Assume a production process where:

\[ q = 20K^{1/2}L^{1/2} \]

- \( q \) = units of output
- \( K \) = units of capital (vertical axis input)
- \( L \) = units of labor (horizontal axis input)
- \( r \) = the rental rate per unit of \( K = $80 \)
- \( w \) = the per unit cost of labor = $20

a) What is the equation of the \( q = 100 \) isoquant?

\[ \Rightarrow 100 = 20K^{1/2}L^{1/2} \]
\[ \Rightarrow K^{1/2}L^{1/2} = 5 \]
\[ \Rightarrow K^{1/2} = \frac{5}{L^{1/2}} \]
\[ \Rightarrow K = \frac{25}{L} \]

b) What is the SR TC of producing \( q = 120 \) if \( K \) is fixed at \( K = 4 \)?

If \( K = 4 \)
\[ \Rightarrow 120 = 20(4)^{1/2}L^{1/2} \]
\[ \Rightarrow L^{1/2} = 3 \]
\[ \Rightarrow L = 9 \]

\[ \Rightarrow SR \text{ TC} = rK + wL \]
\[ = (80)(4) + (20)(90) \]
\[ = 320 + 180 = 500 \]

c) What is the minimum LR TC of producing \( q = 120 \)? (Hint: \( MP_L/MP_K = K/L \)).

\[ \Rightarrow 1) \text{ equal slopes:} \quad \frac{MP_L}{MP_K} = \frac{w}{r} \]
\[ \Rightarrow \frac{10K^{1/2}L^{1/2}}{10K^{-1/2}L^{1/2}} = \frac{20}{80} \]
\[ \Rightarrow \frac{K}{L} = \frac{1}{4} \]
\[ \Rightarrow L = 4K \]

\[ \Rightarrow 2) \text{ sub into prod fn constraint:} \]
\[ 120 = 20K^{1/2}(4K)^{1/2} \]
\[ \Rightarrow 120 = 20K^{1/2}2K^{1/2} \]
\[ \Rightarrow 120 = 40K \]
\[ \Rightarrow K^4 = 3 \]
\[ \Rightarrow K = 3 \]
\[ \Rightarrow L = 4K = 12 \]

\[ \Rightarrow LR \text{ TC} = (80)(3) + (20)(12) \]
\[ = 240 + 240 = 480 \]
4. Assume the FCC has announced plans to auction off a license for the right to sell wireless communication products and services in a given market. One company, Tellcomm, is considering bidding on the license. The company’s research department has provided Tellcomm management with the following information:

\[ P = \text{average license bid price at previous auctions} = \$80 \text{ million} \]
\[ N = \text{average population in previous auction markets} = 10 \text{ million} \]
\[ E = \text{estimated license price elasticity with respect to average market population} = +1.4 \]
\[ \text{population in market where new license is up for bid} = 15 \text{ million} \]

a) Explain the meaning of the price elasticity number reported above.

\[ E = \frac{\% \Delta P}{\% \Delta N} = \text{elasticity of bid } P \text{ w.r.t. population in mkt vs avg mkt} \]
\[ \text{the expected } \% \text{ change in } P \text{ (1.4) for each } 1\% \text{ change in } N \]
\[ \text{(in same direction)} \]

b) Provide Tellcomm management with your estimate of what minimum bid will be required to purchase the new market’s license.

\[ +1.4 = \frac{70 \Delta P}{+50} \]
\[ \Rightarrow 70 \Delta P \text{ (from avg)} = (50)(+1.4) = +70 \%
\]
\[ \Rightarrow \text{est'd bid } P = (1.70)(80 \text{ mil}) \]
\[ = \$136 \text{ mil} \]

(c) In the short run, assume Tellcomm would have substantial fixed costs to sell their product in the given market. Do these high (vs. low) fixed costs mean the company is more or less likely to stop selling in this market (i.e., ‘shut down’) in the short run?

Tellcomm would shut down if \( TR \leq TVC \)
\[ \text{or } P < AVC \]

SR fixed costs have no bearing on the SR shut down decision.
5. Assume Iowa Steaks produces boxes of ribeye steaks the company sells in two markets - the Eastern U.S. (E) market and the Western U.S. (W) market.

Information provided to management includes:

\[ \begin{align*}
D_E: \quad P_E &= 80 - .2Q \\
D_W: \quad P_W &= 50 - .125Q \\
MC_E &= 20 \\
MC_W &= 10
\end{align*} \]

where

- \( P \) = price per box
- \( Q \) = quantity (000 per week)
- \( MC \) = marginal cost of producing and selling (per additional box)

a) If Iowa steaks practices 'price discrimination', what price should the company charge in each market to maximize total company profits?

- Set \( MR = MC \) in each market to find \( \text{TI-max } Q \); plug into \( D \) eqn to get \( P \)

- \( E \): \( 80 - .4Q = 20 \Rightarrow Q_E = 150 \Rightarrow P_E = 80 - .2(150) = 50 \)

- \( W \): \( 50 - .25Q = 10 \Rightarrow Q_W = 160 \Rightarrow P_W = 50 - .125(160) = 30 \)

b) If the marginal cost of producing and selling a box of steaks in each market were the same, say \( MC = $10 \), should Iowa steaks then also charge the same price in each market? Explain or show why you agree or disagree.

- No, because \( D \) and \( MR \) are NOT the same

- \( P_E = MR = MC \Rightarrow 80 - .4Q = 10 \Rightarrow Q_E = 175 \Rightarrow P_E = 80 - .2(175) = 45 \)

- \( P_W = 30 \) (from 'a' above), \( P_W = 45 \)

c) If this company were to 'bundle' its steaks and its own special steak sauce, what would it do?

- Would sell steaks & sauce together (in a 'bundle') and charge 1 price for both products combined, presumably to generate more revenue than by pricing & selling each separately.
6. Assume the graph below contains economic information for a given firm. Refer to it to answer the questions below.

![Graph with demand, marginal revenue, average total cost, average variable cost, and marginal cost curves]

a) Is this firm a price setter or a price taker? **denoted by horizontal firm demand curve (= d = MR)**

b) What is TFC for this firm?
\[ \text{Total Fixed Cost (TFC)} = \text{ATC} \times Q = (\text{ATC} - \text{AVC}) \times Q = (8.40 - 7.00) \times 600 = \$540 \]

c) What is maximum attainable profit for this firm?
\[ \text{Profit} = \text{TR} - \text{TC} \]
\[ = (P \times Q) - (\text{ATC} \times Q) = (10) \times (600) - (5.40) \times (600) = \$960 \]

d) At what price would this firm shut down in the short run?
\[ \text{Shut down price} = \text{Min AVC} = \$6.00 \]

e) If price = $10, identify the break-even points in the graph (label Q_{BE}). See graph.

f) What is TVC at Q = 600?
\[ \text{TVC} = \text{Avc}(Q) \]
\[ = (7.00) \times (600) \]
\[ = \$4200 \]
7. American Protein produces its product out of two plants (A and B). The SR TC curve for each plant is given in the graph below.

![Graph showing TC_A and TC_B with TVC_A and TVC_B]

a) Identify and label in the graph TFC_A and TFC_B.

   **See graph**

b) Draw and label in the graph TVC_A and TVC_B.

   **See graph**

c) Assuming no capacity constraint in either plant, the company would produce all of its output in the short run out of plant B and let plant A sit idle. Explain why you agree or disagree with this statement.

   **Agree.** In SR, fixed costs of both plants must be paid whether a plant produces or not. Thus, should produce out of plant in which the incremental (marginal) costs are the lowest. This is true for plant B (lower slope of TC)

   

   \( MC_B < MC_A \) for all