MERGER ANTITRUST LAW

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Georgetown University Law Center
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Tuesdays and Thursdays, 3:30-4:55 pm
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CLASS 11 WRITTEN ASSIGNMENT—INSTRUCTOR'S ANSWERS

Instructions

Submit by email by 3:30 pm on Tuesday, October 2
Send to dale.collins@shearman.com
Subject line: Merger Antitrust Law: Assignment for Class 11

Assignment

Calls for short answers. If you want to use math or graphs in your answers, please feel free to write your answers using a pencil and paper (rather than a computer). Attach either a scan or a photograph to your email.

Assume the following:

1. The firm's residual demand curve is linear
2. The firm has no fixed costs and constant marginal costs
3. The firm's control variable is quantity (i.e., we are assuming Cournot behavior)

Questions:

1. Explain the concept of a demand curve. Why is it downward sloping?
2. Explain the concept of marginal revenue and how it relates to gross revenue gains and losses associated with incremental sales.
3. Explain the concepts of total cost and marginal cost.
4. Explain why the firm maximizes profit when marginal revenue equals marginal cost.
5. Explain what the firm should do and why if it finds that marginal revenue is greater than its marginal cost at current production (say because of a shift in demand).

If you have any questions, send me an e-mail. See you in class. Dale

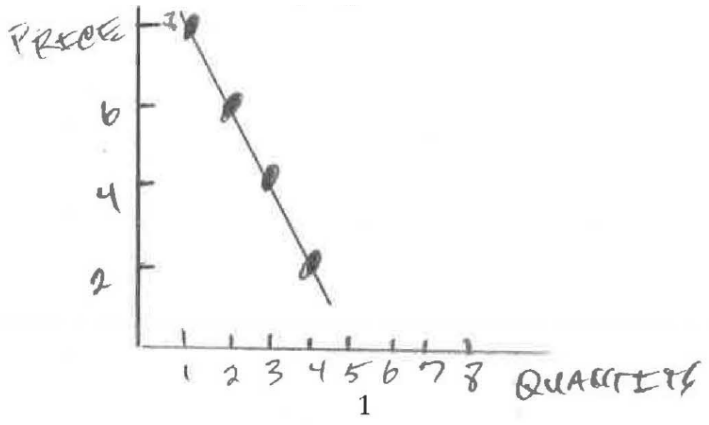
Questions:

1. **Explain the concept of a demand curve. Why is it downward sloping?**

   Every customer has a maximum willingness to pay for the firm's product. Some customers will not value the product very much and so will have a low maximum willingness to pay, while other customers will place greater value on the product and have a higher willingness to pay. Customers will purchase a product only if the product's price at or below the customer's maximum willingness to pay. Accordingly, at low prices, more customers will purchase the product than at higher prices. For example, say there are four customers in the market with the following willingness to pay:

Customer	MWP
A	8
B	6
C	4
D	2

   Then one customer would purchase the product at a price of 8, two at 6, 3 at 4, and 4 at two. This traces out a downward-sloping demand curve.



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2. **Explain the concept of marginal revenue and how it relates to gross revenue gains and losses associated with incremental sales**.

Marginal revenue is the addition revenue the firm earns with the sale of one additional unit of product. Marginal revenue consists of two parts:

a. The gross gain in revenue due to the sale of the additional product, and
b. The gross loss in revenue due to the fact that the firm, which faces a downward-sloping demand curve, has to lower its price on *all* products by some amount in order to sell the additional unit.

Let q be the original level of sales and q+1 be the original sales plus one unit. Let p be the original price and Δp be the decrease in price required to sell the additional unit. Then the gross gain in revenues on the additional sale is equal to one times p-Δp (the new price charged for the additional UNIT sale) and the gross loss on the lower price that the firm now has to charge is q times the drop in price Δp. In other words:

Marginal revenue = Gain in revenue due to the additional sale
– Loss on prior units sold due to the decrease in the market-clearing price

$= [1 \times (p - \Delta p)] - [q\Delta p]$

$= p - (q+1)\Delta p$

This is the slope of the demand curve. Since the demand curve is downward-sloping, this term is negative.

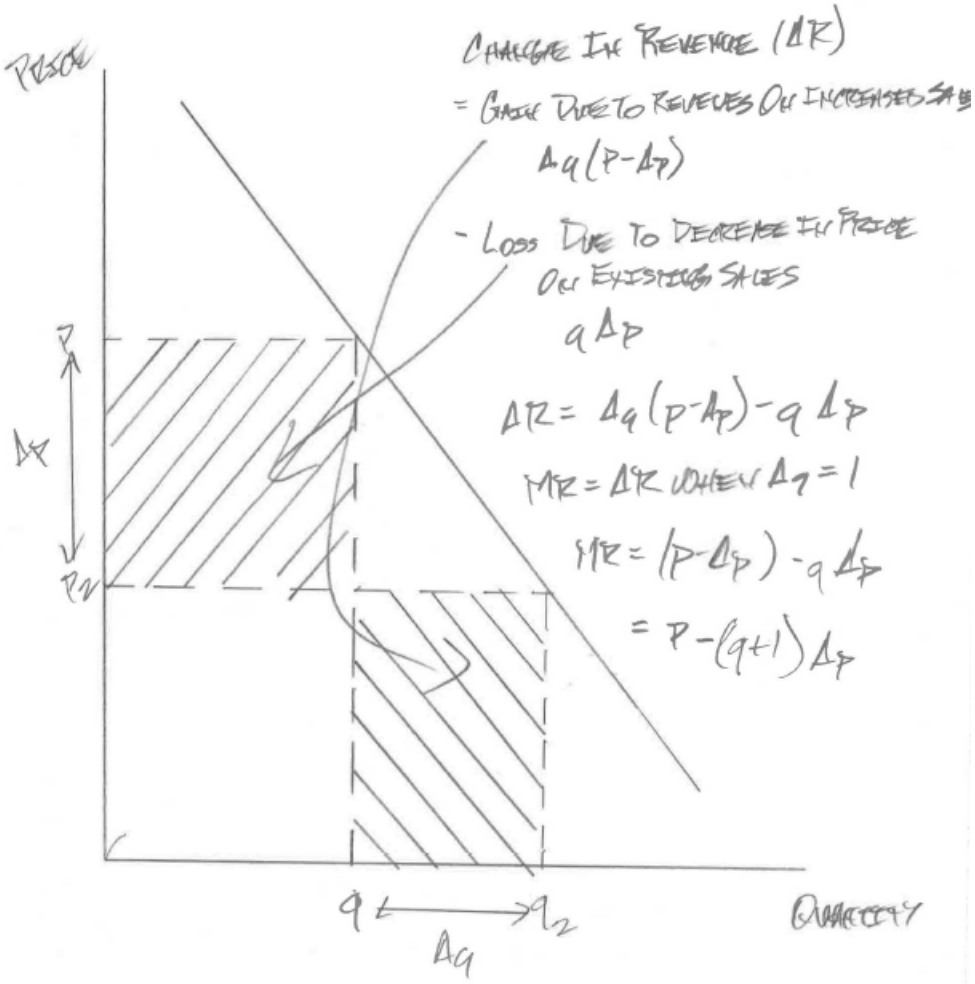
In calculus terms:[1]

$$\text{Revenue (r)} = p \times q$$

$$\text{Marginal revenue (mr)} = \frac{dr}{dq} = p + q\frac{dp}{dq}$$

[1] Calculus is not required. I include the calculus for those of you want to use it.

Answer to Question 2 (con't)



3. Explain the concepts of total cost and marginal cost.

   Total cost *TC* is the sum of all costs of manufacturing a production level *q*. Conventionally, costs are broken down into two types: *fixed costs* (*F*), which do not vary with the production level (such as the CEO's salary or the maintenance of the headquarters building), and (total) *variable costs* (V), which change with the level of production.

$$TC(q) = F + V(q)$$

   Marginal cost (*c*) is the cost to produce one additional unit. Since marginal cost may depend on the current production level *q*, it is a function of *q*.

$$\begin{aligned} C(q) &= TC(q+1) - TC(q) \\ &= F + V(q+1) - F + V(q) \\ &= V(q+1) - V(q) \end{aligned}$$

   In calculus terms:

$$\begin{aligned} TC(q) &= F + V(q) \\ c(q) &= \frac{dTC}{dq} = \frac{dV}{dq}. \end{aligned}$$

   A *constant marginal cost* is a marginal cost that does not change with the production level. If *c* is a constant marginal cost, then $V(q) = c \times q$ and $TC(q) = F + c \times q$.

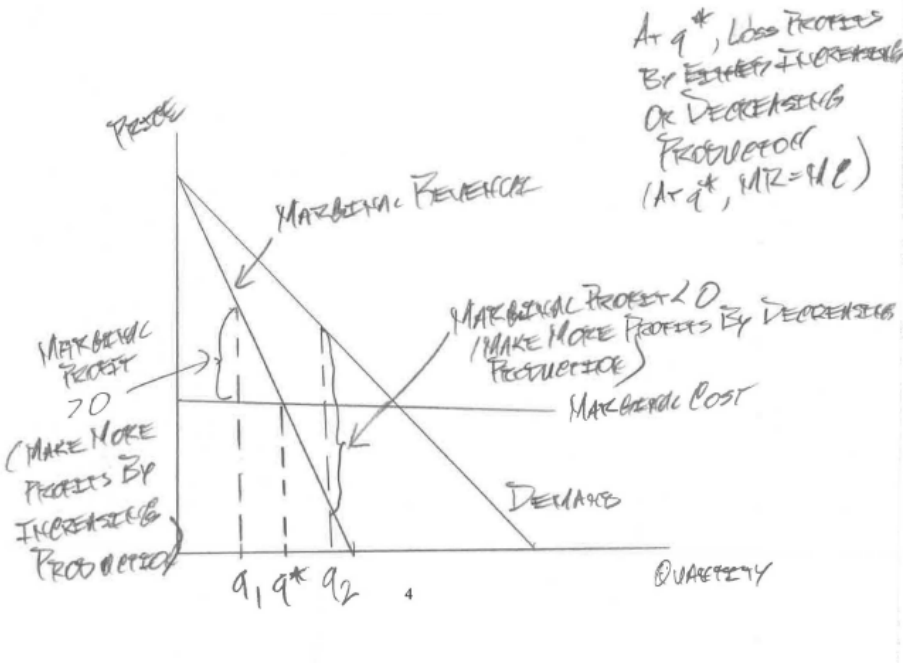
4. Explain why the firm maximizes profit when marginal revenue equals marginal cost.

   If marginal revenue is greater than marginal cost, then by producing one additional unit the firm earns more revenues than it expends in producing the additional unit. A profit-maximizing firm would therefore increase its production by one unit, and then ask again whether marginal revenue would be greater than marginal cost for the production of yet another addition unit. If so, the firm should produce the additional unit. This iterative process should continue until marginal revenue is less than marginal cost, at which point the firm would lose profits by producing an additional unit. This means that the firm should produce a level of output so that marginal revenue equals marginal cost.

$$\begin{aligned}\text{Profits } (\pi) &= \text{Revenues - total costs} \\ &= pq - \left[F + V(q)\right]\end{aligned}$$

In calculus terms: The first-order condition for a profit maximum set the derivative of profits with respect to quantity equal to zero, so marginal revenue is equal to marginal total costs (which is equal to marginal cost):

$$\begin{aligned}\frac{d\pi}{dq} &= \frac{dr}{dq} - \frac{dV}{dq} = 0 \\ &= \left[p + q\frac{dp}{dq}\right] - \left[\frac{dV}{dq}\right] = 0.\end{aligned}$$



5. Explain what the firm should do and why if it finds that marginal revenue is greater than its marginal cost at current production (say because of a shift in demand).

   For the reason explained in the answer to Question 4, whenever the firm finds that its marginal revenue is greater than its marginal cost, it should increase its output until marginal revenue is again equal to marginal cost.