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ECON 202—Montgomery College

TOPIC 18: COMPETITION I

I. Terminology
   a. *Fixed cost*—cost which ***does not*** increase as output increases (total fixed costs: TFC)
   b. *Variable cost*—cost which ***does*** increase as output increases (total variable costs: TVC)
   c. *Total cost*—total fixed costs plus total variable costs (TC)
   d. *Average total cost*—total cost divided by total output (ATC)
   e. *Total revenue*—total output times price per unit (TR)
   f. *Marginal cost*—the additional cost to produce one more unit of output (MC)
   g. *Marginal revenue*—the additional revenue from selling one more unit of output, aka price (MR=P)
   h. *Profit*—Total revenue minus total cost: TR – TC; also can be calculated as quantity (Q) times the difference between revenue per unit and cost per unit: Q(P – ATC).

II. An example

Output	TFC	TVC	TC	MC
0	25	0		
1	25	4		
2	25	12		
3	25	24		
4	25	40		
5	25	60		
6	25	84		

Output	ΔΠ	Π	TR	TC	ATC	MC	MR
0							
1							20
2							20
3							20
4							20
5							20
6							20

a. Assume this is a person selling old clothes at a yard sale. Assume the fixed costs is the advertising and basic set up requirements of the sale, the variable costs reflect the increasing difficulty of finding clothes the person is willing to sell, and the output is in boxes of clothes (sold at $20 each). We use Π to indicate profit.
b. Recall that all individuals are rational and therefore act until the marginal benefit equals the marginal cost: MB=MR=P=MC
    i. How many boxes of clothes should you sell?
    ii. Note the profit is the same for two different quantities. This is an artifact of the analysis (where MR=MC). If the additional costs equal the additional revenue, then there should be no different in profit.
    iii. Mathematically, it's because the actual maximum is between 4 and 5 units. But our prices are "lumpy": you can't buy half a unit and pay half as much to make it. If you're interested in what the actual profit maximizing quantity is, you'll need to use some calculus on the total cost curve (here, it is $TC = 25+2Q^2$).[1]

III. Perfect (or pure) competition
a. We now have the basic structure of what economists call "perfect competition." Despite its name, perfect competition is not some ideal state. It reflects "pure" competition; no seller has any sort of advantage over other sellers.
    i. Some economists call it pure competition to avoid the common misconception that perfect competition is somehow a goal.
b. To have perfect competition, four things need to be true.
    i. Many buyers and many sellers—no one person can control the price.
    ii. Freedom of entry and exit—it is easy to enter a market (say, by starting a new business) and easy to leave it.
    iii. Perfect information—as we discussed last unit, a lot of complexities come in if allow some to know more than others. We assume everyone has all the relevant information.
    iv. Homogenous products—sellers cannot distinguish some products from their competitors. Everyone sells the same thing.
c. If these conditions hold, everyone—producers and consumers—is a *price taker*. No one person/firm can influence a product's price.

[1] Specifically, you take the derivative and set it equal to 20, which is still the marginal revenue. It's worth noting that since calculus is not required for this course, I do not expect you to do this.

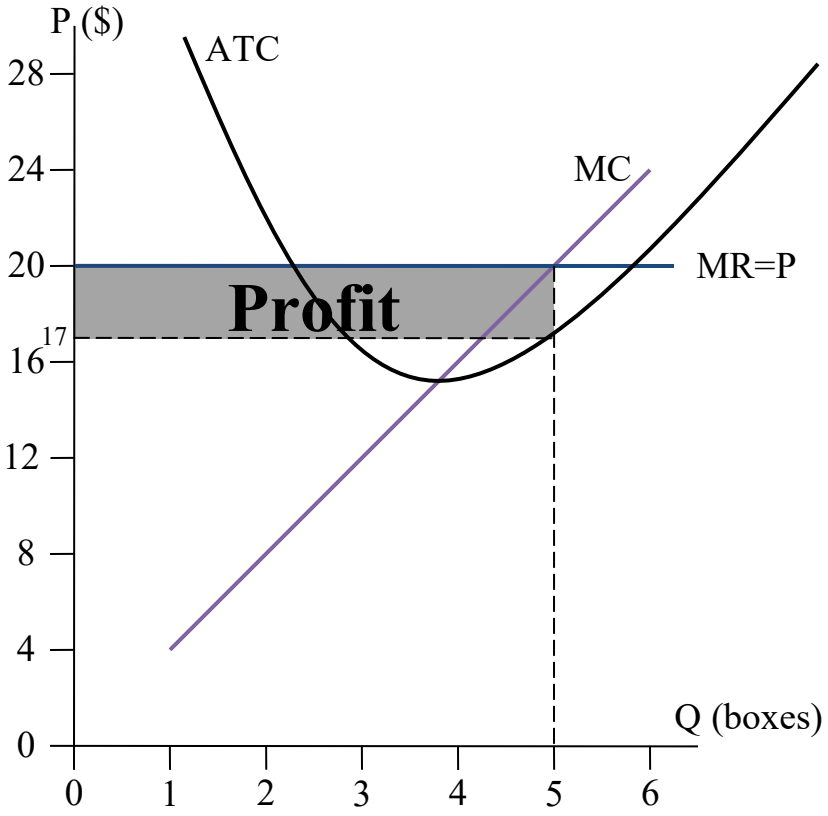
IV. Let's begin with filling out the table:

Output	*TFC*	*TVC*	*TC*	*MC*
0	25	0	**25**	
1	25	4	**29**	**4**
2	25	12	**37**	**8**
3	25	24	**49**	**12**
4	25	40	**65**	**16**
5	25	60	**85**	**20**
6	25	84	**109**	**24**

Output	*ΔΠ*	*Π*	*TR*	*TC*	*ATC*	*MC*	*MR*
0		**-25**	**0**	**25**			
1	**16**	**-9**	**20**	**29**	**29.00**	**4**	20
2	**12**	**3**	**40**	**37**	**18.50**	**8**	20
3	**8**	**11**	**60**	**49**	**16.33**	**12**	20
4	**4**	**15**	**80**	**65**	**16.25**	**16**	20
5	**0**	**15**	**100**	**85**	**17.00**	**20**	20
6	**-4**	**11**	**120**	**109**	**18.17**	**24**	20

a. Note that price is constant, marginal cost is increasing, and average total cost has a U-shape.
    i. One rule that bears mentioning—but hard numbers make it hard to capture due to their lumpiness—is that the marginal cost curve *always* intersects the average total cost curve at its lowest point.
    ii. If an additional unit costs less than the average unit costs, producing that unit should lower ATC.
    iii. If an additional unit costs more than the average unit costs, producing that unit should increase ATC.
    iv. If an additional unit costs the same as the average unit costs, producing that unit should not change ATC.[2]
b. Let's aggregate this information into a diagram using these relationships.

[2] If you're curious about the mathematical proof for this rule, let me know and I'll happily walk you through it. But it requires calculus so I leave it out in the notes to avoid confusion.



c. The process for solving this diagram is always the same:
   i. Find the quantity where MC = MR.
   ii. At that quantity, how much does each unit sell for (here it's the constant, MR=P)?
   iii. At that quantity, how much does each unit cost to make (by referencing the ATC curve)?
   iv. The difference between the price and the cost-per-unit is the profit-per-unit.
   v. Multiplying the profit-per-unit the number of units (quantity) gives you the total profit.

V. Proof

a. $\Pi = TR - TC = PQ - TC$

b. $\Pi = 1(PQ - TC) = \frac{Q}{Q}(PQ - TC) = Q\frac{1}{Q}(PQ - TC)$

c. $\Pi = Q\left(\frac{PQ}{Q} - \frac{TC}{Q}\right) = Q\left(P - \frac{TC}{Q}\right) = Q(P - ATC)$