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ECON 202—Montgomery College

LECTURE 28: COMPETITION II

I. Recall last class:

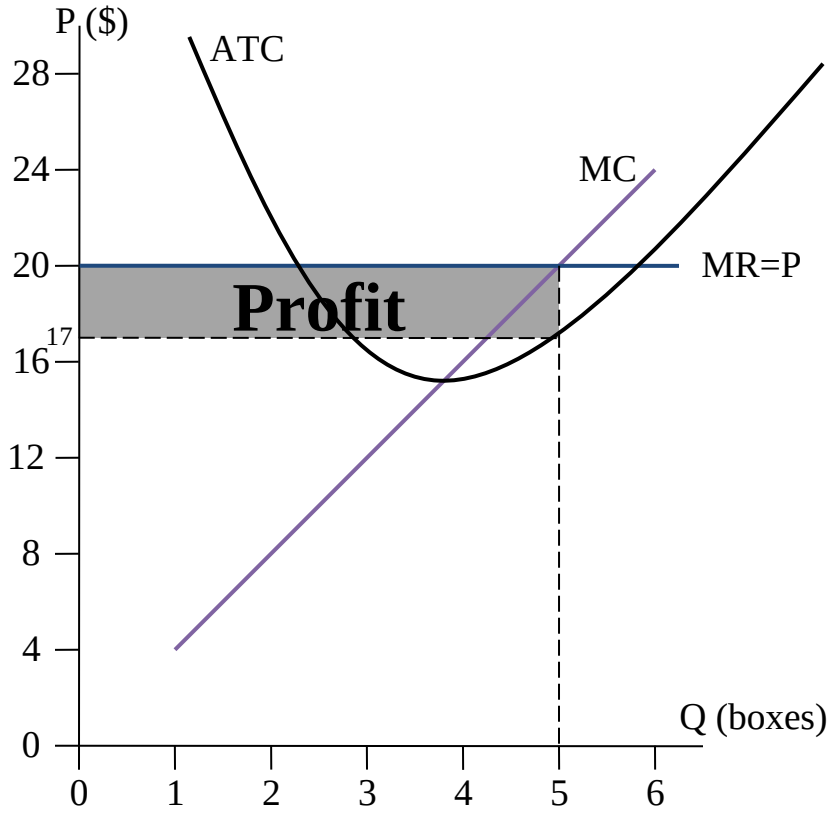
Output	*TFC*	*TVC*	*TC*	*MC*
0	25	0	**25**	
1	25	4	**29**	**4**
2	25	12	**37**	**8**
3	25	24	**49**	**12**
4	25	40	**65**	**16**
5	25	60	**85**	**20**
6	25	84	**109**	**24**

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.[1]

[1] 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.

b. Let's aggregate this information into a diagram using these relationships.



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.

II. Proof

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

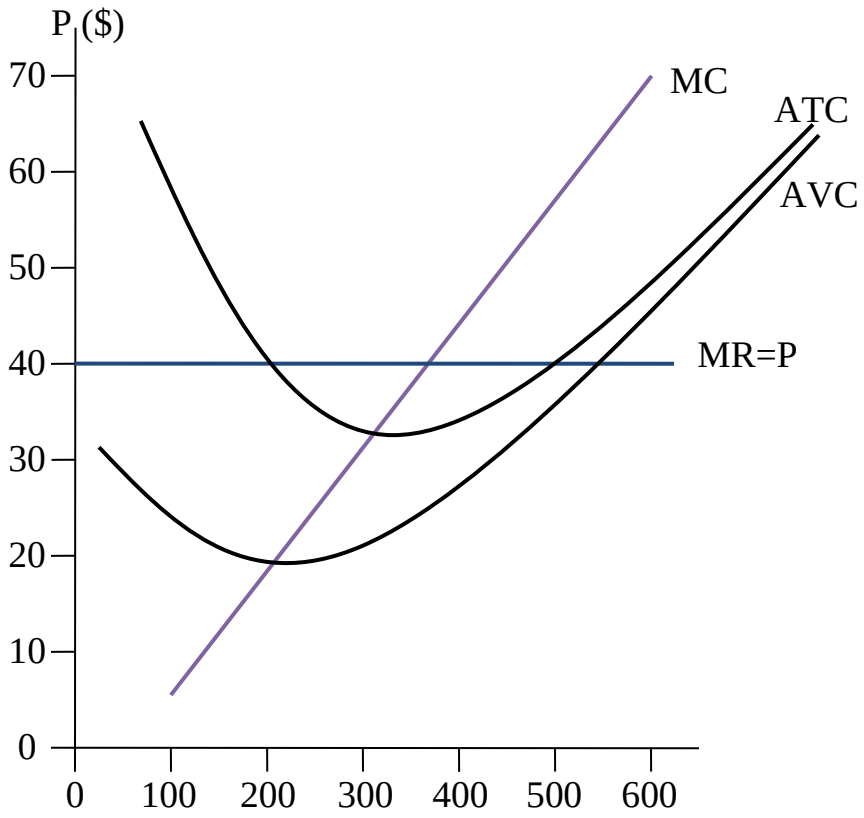
b. $\Pi = 1(PQ - TC) = \frac{Q}{Q}(PQ - TC) = Q\frac{1}{Q}(PQ - TC)$

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

III. Shutdown points

a. Why do ice cream stores stay open during the winter?

b. Recall that ATC = AFC+AVC. Let's add AVC to a generic diagram.



   i. Note that AVC looks just like ATC except it gets closer to ATC. This is because AFC is always decreasing so, as quantity increases, the difference between ATC and AVC shrinks.

c. If price drops below ATC, we might claim the firm goes out of business. And, in the long-run, it will. But the short-run is a different matter.

d. Consider the ice cream store.
   i. If the price is below ATC, but above AVC, the firm is covering their variable costs (like labor and ingredients), even if it's not covering its fixed costs (like rent or loan payments).
   ii. If the firm closed, like an ice cream store during the winter, it would still have to pay all of its fixed costs without making any revenue.
   iii. If the firm stayed opened, it would be making enough to cover its variables and cover *some* of its fixed costs. It couldn't do this forever, but it loses less by staying open during the winter.
   iv. If the price fell below AVC, it couldn't even pay for workers; it would lose more by staying open during the winter.

e. The low point of ATC represents the *long-run shut-down point*. It's the lowest the price can be and the firm still stays open over the long-run. It might lose money day-to-day or even quarter-to-quarter (like retail stores) but not so much it can't even cover the variable costs.
f. The low point of AVC represents the *short-run shut-down point*. It's the lowest the price can be and the firm still stays open over the short-run.