

Problem Set #4

NOTE - If you are turning in this problem set for credit, you must turn in only the 2 "Solution Pages" which are included after this problem set.

Assume the following cost information for a firm in a perfectly competitive industry (this is the same example we used in the previous problem set):

Output	TVC	TFC	TC	AVC	AC	MC
6	105	40	145	17.50	24.17	11
7	116	40	156	16.57	22.29	13
8	129	40	169	16.13	21.13	15
9	144	40	184	16.00	20.44	17
10	161	40	201	16.10	20.10	19
11	180	40	220	16.36	20.00	21
12	201	40	241	16.75	20.08	23
13	224	40	264	17.23	20.31	25
14	249	40	289	17.79	20.64	27
15	276	40	316	18.40	21.07	29
16	305	40	345	19.06	21.56	31
17	336	40	376	19.76	22.12	33
18	369	40	409	20.50	22.72	

a) Suppose now that there are 100 identical firms in the industry, and that the demand curve for the industry is given by: $P = 46 - Q/100 = 46 - .01Q$ (or the following table):

P	34	33	32	31	30	29	28	27	26	25
Q	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100
P (cont)	24	23	22	21	20	19	18	17	16	
Q (cont)	2200	2300	2400	2500	2600	2700	2800	2900	3000	

What will be the short run equilibrium price and output (for the industry) in this market and how much profit will each firm earn?

b) Suppose instead that there are 120 of these identical firms in the industry, and that the demand curve remains the same. What will be the short run equilibrium price and output (for the industry) in this market and how much profit will each firm earn?

c) Suppose instead that there are 200 of these identical firms in the industry, and that the demand curve remains the same. What will be the short run equilibrium price and output (for the industry) in this market and how much profit will each firm earn?

d) Suppose instead that there are 280 of these identical firms in the industry, and that the demand curve remains the same. What will be the short run equilibrium price and output (for the industry) in this market and how much profit will each firm earn? Now using what you have learned in parts a through d, fill in the blanks on the following statements:

- i) Other things being equal, adding more firms to a competitive industry in the short run causes price to _____ (rise, fall) and profit to _____ (rise, fall).
- ii) Other things being equal, taking away some firms from a competitive industry in the short run causes price to _____ (rise, fall) and profit to _____ (rise, fall).

e) Suppose now that a plant of this size (with fixed costs of \$40) generates the minimum long run average costs, and that this industry exhibits constant costs. The industry still has the demand curve given above. Determine the long run price in this industry, the total output in the industry, the profits for each firm, and the number of firms in the industry (round off in this section and the ones to follow, if the number of firms is not an integer). Explain why the number of firms changes in the long run - that is, if there are more firms in the long run, explain why the extra firms enter the industry, and if there are less firms in the long run, explain why some firms have exited from the industry.

f) Return to the situation in part a where there are 100 identical firms in the industry and we are in the short run. Now the demand curve falls to:

$$P = 28 - Q/100 = 28 - .01Q \text{ (or the following table):}$$

P	24	23	22	21	20	19	18	17	16	15	14
Q	400	500	600	700	800	900	1000	1100	1200	1300	1400

In the short run, what is equilibrium price, output (for the industry), and the profit for each firm? In the long run, what is equilibrium price, industry output, profit per firm, and the number of firms in the industry? Explain why the number of firms changes in the long run - that is, if there are more firms in the long run, explain why the extra firms enter the industry, and if there are less firms in the long run, explain why some firms have exited from the industry.

g) Finally, return to the original situation in part a with the demand curve $P = 46 - .01Q$ and 100 firms. Now a technological innovation occurs which allows new firms to enter immediately with a new long run average cost curve that has its minimum point at $q = 20$ with minimum long run average costs of \$18. The innovation affects only new firms because it is embodied in new capital; firms with old capital must continue to operate on their old average cost curves. New firms enter, but old firms stick around for a while until their capital wears out (because the new capital is so much better, the old capital has very limited resale value). After three years, all the old capital is worn out and is naturally scrapped. What will be the situation after 3 years pass - that is, how many new firms will be operating, what will be the equilibrium price and quantity, and how much profit will each firm earn?