

Economics 335
Problem Set #4

Name: _____

Assume that the manufacturing of cellular telephones is a perfectly competitive industry. The market demand for cellular phones is described by a linear demand function $Q^D = 208 - p$, where p denotes the market price. There are 24 firms that manufacture cellular phones in the industry. Each firm has the same production costs. Individual firm costs are given by the following total cost function,

$$C(q) = 64 + q^2.$$

1.a What assumption for firm behavior is implied by a cost function?

1.b What is the fixed cost?, What are the variable costs?, What is the average cost function?, What is the average variable cost function?

1.c What is the marginal cost function?

1.d Explain intuitively why marginal costs might depend on the output quantity, q .

1.e At what output level is average cost minimized? At what output level is average variable cost minimized?

1.f Draw a graph of the average cost function. What factors cause the average cost to decline initially, reach a minimum, and then rise?

1.g Below what price will **short run** supply be zero?

1.h Derive an individual firms **short run** supply curve.

1.i Below what price will **long run** supply be zero?

1.j Derive the individual firm **long run** supply curve.

1.l Derive the industry **long run** supply curve.

1.m Find the equilibrium market price and aggregate quantity traded in the market.

1.n How much output does each firm produce?

1.o How much profit does each firm earn?

1.p Based on your answer above, is this market in equilibrium? Explain.

2. Consider the following market model where there are two firms. Assume that the firms behave competitively, that is, they make output decisions as if the output price is determined independently of their output choice. Assume that there is a market inverse demand curve given by $P(Q) = 48 - Q$.

The cost functions for the firms in the industry are given by

$$\begin{aligned}C_1(q_1) &= 18 + 2q_1 + \frac{1}{2}q_1^2 \\C_2(q_2) &= 25 + q_2^2\end{aligned}$$

Consider only long run costs in analyzing this problem.

2.a What output level minimizes firm 1's average cost (AC)?

2. b What is AC for firm 1 when it produces the AC-minimizing output quantity?

2.c What output level minimizes firm 2's average cost (AC)?

2.d What is AC for firm 2 when it produces its AC-minimizing output quantity?

2.e. Derive the long run supply equation for each firm.

2.f What is the market supply function? **HINT:** The supply function will have 3 parts.

2.g Find the market equilibrium price.

2.h Find the equilibrium quantity that is supplied by each firm.

2.i Calculate each firm's profits.

2.j Now suppose there is a shift in consumers' preferences for this product. The demand in the market falls giving a new inverse demand $P(Q) = 22 - Q$. What is the equilibrium price and quantity under the new demand?

2.k How much does each firm produce under the new demand conditions, and what are each firm's profits?

2.1 Suppose that there is an investor, a *new firm*, that is contemplating entry into this market. The new firm can adopt a technology that is identical to firm 1's technology (which means that it will have the same cost function as firm 1). Should the new firm enter the market? Explain.