Econ 100D: Principles of Economics NAME: _____

Problem set 6, due Tuesday, November 25th

Suppose that every (profit-maximizing) firm in a particular (perfectly competitive) industry has the cost function $C(q) = \frac{1}{20}q^2 + 80$, and thus the marginal cost function $MC(q) = \frac{1}{10}q$, where q is the quantity of output it produces. Market demand is given by the function $Q_d(p) = 1000 - 50p$. Let n be the number of firms.

a) Find the supply function of each firm, $q_s(p)$, and use this to find the market supply function, $Q_s(p) = n \cdot q_s(p)$.

For parts b-d, suppose that in the short run there are 5 firms in the industry.

b) The short run market equilibrium price is _____. At this price, each firm produces $q =$ _____ units, and all the firms together produce $Q =$ _____ units.

c) Each firm has revenue $R =$ _____, cost $C =$ _____, and profit $\pi =$ _____.

d) Do firms want to enter or exit?

For parts e-g, suppose that in the short run there are 45 firms in the industry.

e) The short run market equilibrium price is _____. At this price, each firm produces $q =$ _____ units, and all the firms together produce $Q =$ _____ units.

f) Each firm has revenue $R =$ _____, cost $C =$ _____, and profit $\pi =$ _____.

g) Do firms want to enter or exit?

Now we consider the long run equilibrium, in which firms do not want to enter or exit.

h) Find each firm's average cost function, $AC(q)$.

i) In the long run equilibrium, the price is $\tilde{p} =$ _____, and each firm will produce $\tilde{q} =$ _____ units of output.

j) Therefore, the number of firms in the long run equilibrium is $n^* =$ _____.

k) Find each firm's average variable cost function, $AVC(q)$.

l) On graph A below, draw an individual firm's $AC(q)$ function, $AVC(q)$ function, and $MC(q)$ function. Draw lines representing the price in the case with 5 firms, 45 firms, and n^* firms.

m) On graph B below, draw the market demand function $Q_d(p)$, as well as the three market supply functions $Q_s(p)$ corresponding to the case with 5 firms, 45 firms, and n^* firms.