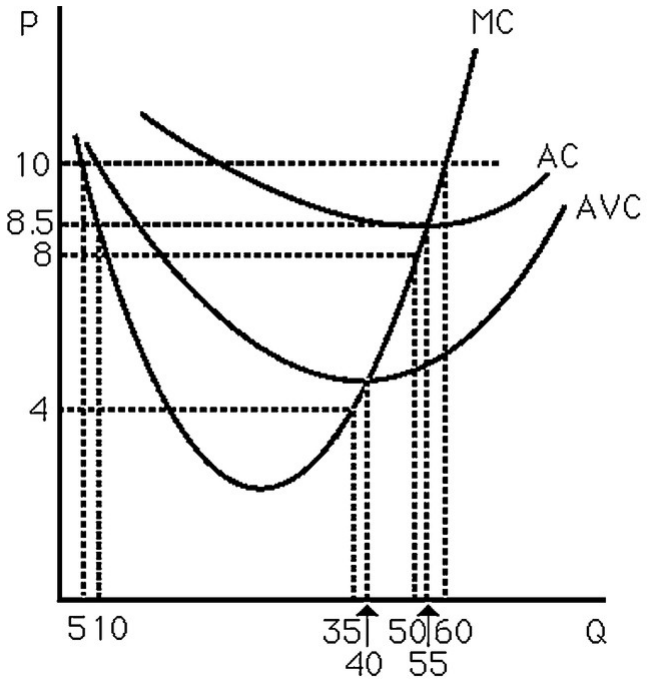
HW 1 -2

1) Suppose a firm has the following total cost function: TC = 100 + $4q^2$. What is the minimum price necessary for the firm to earn profit? Below what price will the firm shut down in the short run?

2)



The above figure shows the cost curves for a typical firm in a competitive market. Note that if p = 10, then MC = p at both q = 5 and q = 60. Can they both yield maximum profit? Explain.

3) Lelu runs a firm that sells multipasses to intergalactic cruises. Her short-run cost function is given by $C(q) = q^2 + 25q + 144$
   a. If the market price is $75/pass, how many units will Lelu produce?
   b. At what price will Lelu earn zero profits?
   c. If the price is below the level you found in b., will Lelu shut down? If so, explain. If not, below what price will she shut down?

4) A firm that only employs labor (L) has the following production function:
   $f(L) = 20L - L^2$
   Let the price of output be normalized to one and the price of labor (relative to output price) is w.
   a. Write out the profit function for this firm as a function of labor, L.
   b. What is the necessary first-order condition for the firm to maximize profit when L>0?
   c. Compute the profit maximizing amount of labor as a function of the wage. What is the effect of an increase in wage on the firm's optimal employment level? Use calculus to solve this.

5) Suppose there are 1000 identical wheat farmers. For each, TC = 10 + q^2. Derive the market supply curve.

6) Suppose there are 1000 identical wheat farmers. For each, $TC = 10 + q^2$. Market demand is $Q = 600{,}000 - 100p$. Derive the short-run equilibrium Q, q, and p. Does the typical firm earn a short-run profit?

7) Consider a competitive firm with the short-run cost function
$C(q) = 20 + 6q + 5q^2$
The firm faces a market price of p for its output.
a. Derive the firm's profit maximizing condition. Is the sufficient second order condition satisfied?
b. Suppose a specific tax of t ($t < p$) is levied on only this firm in the industry. What is the profit maximizing level of output as a function of p and t? (Assume the price is high enough that the firm does not shut down)
c. How does the output change as the tax increases? Use calculus to determine the relevant comparative static.
d. How does the firm's profit chance as the tax increases? Again, use calculus to determine the relevant comparative static. Show that profit decreases as t increases.

8) Firms in the sandbox industry have the long-run cost curve
$C(q) = F + 6q + 5q^2$
Where F is a positive constant. The sandbox industry has a market demand of $p = 90 - 2q$
a. Suppose F=20. What is the competitive equilibrium price, quantity and number of firms?
b. Suppose F is actually an accreditation fee established by the sandbox sellers association. A firm that avoids this fee will not be able to operate in the industry, and is therefore mandatory. How does the equilibrium price and number of firms vary with F? You do not have to use calculus, but explain whether each increases or decreases with F. How does the profit of each firm vary with F?

9) Suppose anyone with a driver's license is capable of supplying one trip from the airport to the downtown business center on any given day. The long-run supply curve of such trips is horizontal at p = $50, which is the average cost of such trips. Suppose daily demand is $Q = 1000 - 10p$. Calculate the change in consumer surplus, producer surplus and social welfare if the city government requires those people supplying such trips to possess a special license, and the government will issue only 300 licenses.