Chapter 9

1. Suppose that a profit-maximizing firm has the production function $Q(K, L) = K + L$

   (a) If the firm's current level of capital is fixed in the short run at $\bar{K} = 4$, write the optimality condition that the firm's choice of labor must satisfy in order for the firm to maximize profit in the short run.

   (b) Find the firm's profit-maximizing level of labor L^*_{SR} as a function of w and P.

   (c) Now suppose that $P = 16$, $r = 2$ and $w = 2$. Find the firm's short-run profit-maximizing level of labor, and the profit maximizing quantity of output.

   (d) Find the firm's short-run profit.

   (e) Write the two optimality conditions that the firm's choice of capital and labor must satisfy in order for the firm to maximize profit in the long run.

   (f) Using the prices above, find the firm's profit maximizing quantity of labor and capital, as well as the firm's profit maximizing quantity of output.

   (g) Find the firm's long-run profit. Explain why the firm's profit increased in the long run as compared to the short run.

2. Suppose that each firm in a perfectly competitive market has long run average cost represented as $TC(Q) = 100Q^2 - 100Q + 100$, and marginal cost $MC(Q) = 200Q - 100$.

   (a) If the firm's goal is to maximize profit in a perfectly competitive market, find the quantity that each firm will choose to sell.

   (b) At what price will firms sell each unit?

   (c) Suppose that the market demand is given by $Q_D = 2000 - 5P$. How many firms will enter the market in the long run?

   Now suppose that, due to changing tastes, consumer demand has shifted outward, such that $Q_D = 2400 - 6P$

   (d) Find the new price and quantity that each firm will sell the good at in the long-run (assuming constant input prices).

   (e) How many additional firms will enter the market, in response to the increased demand?