1) The White Company is a member of the lamp industry, which is perfectly competitive. The price of a lamp is $50. The firm's total cost function is

$TC = 1{,}000 + 20Q + 5Q^2$

where TC is total cost (in dollars) and Q is hourly output.

a. What output maximizes profit?
b. What is the firm's economic profit at this output?
c. What is the firm's average cost at this output?
d. If other firms in the lamp industry have the same cost function as this firm, is the industry in equilibrium? Why or why not?

2) The long- run supply curve for a particular type of kitchen knife is a horizontal line at a price of $3 per knife. The demand curve for such a kitchen knife is

$Q_D = 50 - 2P$

where Q_D is the quantity of knives demanded (in millions per year) and P is the price per knife (in dollars).

a. What is the equilibrium output of such knives?
b. If a tax of $1 is imposed on each knife, what is the equilibrium output of such knives? (Assume the tax is collected by the government from the suppliers of knives.)
c. After the tax is imposed, you buy such a knife for $3.75. Is this the long run equilibrium price?

3) The Coolidge Corporation is the only producer of a particular type of laser.
The demand curve for its product is
$Q = 8{,}300 - 2.1P$
and its total cost function is
$TC = 2{,}200 + 480Q + 20Q^2$
where P is price (in dollars), TC is total cost (in dollars), and Q is monthly output.
a. Derive an expression for the firm's marginal revenue curve.
b. To maximize profit, how many lasers should the firm produce and sell per month?
c. If this number were produced and sold, what would be the firm's monthly profit?

4) The Madison Corporation, a monopolist, receives a report from a consulting firm concluding that the demand function for its product is

$Q = 78 - 1.1P + 2.3Y + 0.9A$

where Q is the number of units sold, P is the price of its product (in dollars), Y is per capita income (in thousands of dollars), and A is the firm's advertising expenditure (in thousands of dollars). The firm's average variable cost function is

$AVC = 42 - 8Q + 1.5Q^2$

where AVC is average variable cost (in dollars).

a Can we determine the firm's marginal cost curve?

b. Can we determine the firm's marginal revenue curve?

c. If per capita income is $4,000 and advertising expenditure is $200,000, can we determine the price and output where marginal revenue equals marginal cost? If so, what are they?