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**Chapter 7 Problem Set**

**1. The Hamilton Company is a member of a perfectly competitive industry. Like all members of the industry, its total cost function is:**

**TC = 25000 + 150Q + 3Q2**

**Where TC is the firm’s monthly total cost in dollars and Q is the firm’s monthly output.**

1. **If the industry is in long run equilibrium, what is the price of Hamilton’s product?**

If the company is in long run equilibrium, then LRAC = P

So, taking the average of TC, ATC is:

**ATC = 25000 / Q + 150 + 3Q**

Solving for optimal quantity, with the first derivative being and setting to zero:

(-25000 / Q^2) + 3 = 0

-25000 = -3Q^2

Q = 91.29

Therefore, price for this product for a firm in a PC market is:

25000 / 91.29 + 150 + 3(91.29) = 697.72

1. **What is the firm’s monthly output?**

Q = 91.29 from above

**2. Box industry is perfectly competitive. Lowest point on LRAC curve of each identical box producers was $4 and minimum point occurred at output of 1000 boxes per month. Market demand curve was:**

**Qd = 140,000 – 10,000P**

**Where P was the price of a box in dollars per box and Qd was the quantity of boxes demanded per month. The market supply curve for boxes was:**

**Qs = 80,000 + 5,000P**

1. **What was the equilibrium price of a box? Is this the long run equilibrium price?**

1k boxes per month, equilibrium occurs when Qd = Qs

140,000 – 10,000P = 80,000 + 5,000P

P = 15000P = 60000 = 4.0.

Yes, it is the long run equilibrium price, since this price occurs at the minimum of the LRAC curve.

1. **How many firms are in this industry when it is in long run equilibrium?**

With Qd = 140,000 – 10,000(4) = 100000

Each firm produces 1000 units, so there have to be 100 firms in the industry.

**4.** **The supply and demand curves for pears are:**

**Qs = 10,000P**

**Qd = 25,000 – 15,000P**

**Where Qs is quantity (tons) supplied, Qd is the quantity (tons) demanded, and P is the price per pear in hundreds of dollars per ton.**

1. **Plot the supply and demand curves**
2. **What is the equilibrium price?**

Equating Qs and Qd gives us equilibrium price:

10000P = 25000 – 15000P

P = 1

As seen above in the supply and demand curve graphic

1. **What is the equilibrium quantity?**

Plugging in equilibrium price into Qd gives us 25000 – 15000(1) = 10000

Also seen above!

**6. 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:**

**Qd = 50 – 2P**

**Where Qd is the quantity of knives demanded and P is the price per knife in dollars.**

1. **What is the equilibrium output of such knives?**

Since we know price on the supply side, we need to find price on the demand side:

Qd = 50 – 2P

50 – 1/2Q = 3

Q = 44

1. **If a tax of $1 is imposed on each knife, what is the equilibrium output of such knives? Assume tax is collected from suppliers?**

50 - 1/2Q = 4

Q = 42

1. **After the tax is imposed, you buy such a knife for $3.75. Is this the long run equilibrium price?**

No. With p = 25 – 1/2Q, the equilibrium price is 4, because of the tax. Suppliers would be losing money at this price as their net profit would be -.25, with the extra tax dollar going to the government.

**Chapter 8 Problem Set**

**3.** **The Coolidge Corporation is the only producer of a particular type of laser (monopoly). The demand curve for its product is:**

Q = 8300 – 2.1P

And its total cost function is:

TC = 2200 + 480Q + 20Q^2

Where P is price in dollars, TC is total cost in dollars and Q is monthly output.

1. **Derive an expression for the firm’s marginal revenue curve.**

Total revenue = P\*Q

Solving for P to obtain change in revenue given change in quantity:

-2.1P = Q – 8300

P = -1/2.1\*Q + 3952.38

TR = P\*Q

TR = -1/2.1Q^2 + 3952.38Q

MR = 3952.38 - 0.952Q

1. **To maximize profit, how many lasers should the firm produce and sell per month?**

MR = MC maximizes profit

MC = 480 + 40Q

3952.38 – 0.952Q = 480 + 40Q

40.952Q = 3472.38

**Q = 84.79 units**

1. **If this number were produced and sold, what would be the firm’s monthly profit?**

With TR = -1/2.1Q^2 + 3952.38Q and TC = 2200 + 480Q + 20Q^2:

-0.476(84.79)^2 + 3952.38(84.79) – (2200 + 480(84.79) + 20(84.79)^2) = ~$145,012

**4. The Madison Corporation is a monopolist with a demand function of:**

**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 capital incomes in K dollars and A is the firm’s advertising expenditure in thousands of dollars. The firm’s AVC is:**

**AVC = 42 – 8Q + 1.5Q^2**

1. **Can we determine the firm’s marginal cost curve?**

Yes. Since we are only concerned in variable costs, MC is definitely obtainable.

TC = 42Q – 8Q^2 + 1.5Q^3

MC = 42 – 16Q + 4.5Q^2

1. **Can we determine the firm’s marginal revenue curve?**

Given we have Q, and we know total revenue is P\*Q, then we can solve for P:

P = (78 + 2.3Y + 0.9A)/1.1 – Q/1.1

TR = ((78 + 2.3Y + 0.9A)/1.1 – Q/1.1)Q

MR = (78 + 2.3Y + 0.9A)/1.1 – 2Q/1.1

We’d need more info on per capita income and other expense to determine MR curve. So no we cannot determine the MR curve at this point.

1. If per capita income is $4,000 and advertising is $200,000, can we determine price and output where MR = MC? If so, what are they?

Yes. Since we know MC from a above, and we have values for advertising and per capita income, we can solve for MC = MR.

MR solving for P

P = 70.9 + 2.09Y + 0.82A – 0.91Q

TR = 70.9Q + 2.09YQ + 0.82AQ – 0.91Q^2

MR = 70.9 + 2.09Y + 0.82A – 1.82Q

MR = 242.9 - 1.82Q given the values for A and Y above given some rounding

Setting MR = MC

242.9 – 1.82Q = 42 – 16Q + 4.5Q^2 results (from solving quadratic) in

-4.5Q^2 +14.18Q + 200.9

Q = 8.44, or ~8.5

With that in mind, we can plug Q back into P

P = 70.9 + 2.09Y + 0.82A – 0.91Q

P = 242.9 – 0.91(8.5) = ~235.24

**12. Morrison Company**

1. **President feels cost plus pricing is appropriate, marks up AVC by 100% to set price. Comment on this procedure.**

Morrison should set price so MC \* 1/(1-1/n), in this case MC = 20 and price elasticity is 2 (after taking absolute value).

P = 20 \* 1/(1-1/2) = 40

Morrison is currently marking up AVC (which is roughly $20) by 100%, meaning they are using cost plus pricing to the best of their ability to maximize profit. As elasticity increases, markup should then decrease as more substitutes may be available.

1. **Because of heightened competition the price elasticity of demand for the rackets increases to -3. The president continues to use the same cost-plus pricing formula. Comment on its adequacy.**

In this case, Morrison is not optimizing profits. If AVC markup is still 100%, pricing is still $40 per unit. Because of the increase in elasticity due to competition, Morrison should only raise prices roughly 50% to $30. They will be missing out on profit because of non-optimal pricing.