1. Suppose a firm producing a good in a perfectly competitive market faces the following market demand and supply.

Price	Quantity Demanded	Quantity Supplied
$18	2	22
$16	4	18
$14	6	14
$12	8	12
$10	10	10
$8	12	8
$6	14	6

in billions

a. Using the table above, what is the market price for the good? Explain.

In a perfectly competitive market, the quantity demanded equals the quantity supplied at a price of $10 with an equilibrium quantity of 10.

b. Using the figure below, what is the optimal level of output for the firm? Explain.

The firm will equate marginal revenue (MR) and marginal cost (MC) to determine its optimal level of output. For a perfectly competitive firm, the marginal price equals the market price since the firm has to charge this amount no matter how many units it produces. So to find the optimal output, you use the market price of $10 and determine the quantity (q) at which MC equals $10.

c. Illustrate the level of profits or losses at the optimum. Label clearly and explain.

*Since profits are Total Revenues – Total Costs (TC), you have to find total revenues and total costs. From part b, you have the quantity produced and the price charged, $10. This means that total revenues are the product of these. Ok, now for total costs. You know the quantity produced and that Average Total Costs (ATC) = TC/q. So, multiplying the quantity times average total costs you get total costs, q*ATC = TC. Since the MC = $10 at a quantity less than ATC at that quantity, firms are making losses. Total losses are the rectangle from MC = $10 up to the ATC and then over to the y axis.*

d. Is this a long-run equilibrium? If yes, explain. If not, explain and describe what will happen in the short-run and long-run?

Long-run equilibrium is where profits are zero and there is no incentive for firms to enter or exit into the market. With profits negative but the price is above the average variable costs, firms will produce in the short-run but will exit in the long-run. The exiting firms cause the market supply to shift leftward and the market price to rise. The rising price will occur until profits are zero in the market.

e. Now suppose in the market the government places a $4 excise tax. With the tax, what is the new level of output for the firm? Losses/Profits? Is this a long-run equilibrium? If yes, explain. If not, explain and describe what will happen in the short-run and long-run?

If an excise tax (a tax on each unit) of $4 is added, then the market price will rise to $12 but the received price of firms will only be $8 (you can find this from looking at the table – the tax causes a difference between the price paid by consumers and the price received by suppliers of $4 – at a P = $8 the quantity supplied is 8 and a P=$12 the quantity demanded is 8). Since firms are now receiving $8 instead of $10, this lowers the MR curve from what you found in part b. The question now: is the price above Average Variable costs (AVC) where MC = $8. Since the minimum of the AVC is above $8, firms will shut down in the short-run because of the tax.

2. A monopolist faces the following market demand.

Price	Quantity
15	2
14	4
13	6
12	8
11	10
10	12
9	14
8	16
7	18
6	20

TR MR
30 } 26/2 = 13
56 } 22/2 = 11
78 } 18/2 = 9
96 } 14/2 = 7
110 } 10/2 = 5
120

Suppose marginal costs are fixed at $6. Suppose there are no fixed costs.

a. What is the optimal quantity for the monopolist if it can perfectly price discriminate? What is the optimal quantity if the monopolist can only charge one price? Explain.

If the monopolist can price discriminate, it will charge $6 to the last consumer and provide up to a quantity of 20.

However, if the monopolist can only change one price, it will set MR = MC = $6. The MR = 6 at Q = [redacted]. (Find this by calculating TR and finding the change in revenues between each quantity)

10

Note that Q changes by 2!

b. At the optimal outputs from above, what are total profits/losses?

*When the monopolist charges all along the demand curve, the total costs equal 20*6 = 120 (because if MC fixed, MC = AC). The revenues are the rectangle of the total costs plus the triangle, bounded at $6 and up to 16 (ok if you used 15…) and out to 20. The area of this triangle is (10*20).5 = $100.*

*The profits in the case of Q =10, total costs are 10*6 = $60 while revenues are 10*12 = $120 with profits $50.*

c. At the optimums, what is the size of deadweight losses? Explain.

The monopolist charges exactly what each consumer is willing to pay up to 20. This means that it has effectively taken all the consumer surplus – no deadweight loss.

The perfectly competitive price and out put is $6 and 20 units, but the monopolist who only charges [redacted]. This means that there is a deadweight loss – lost consumer surplus. [redacted]

3. Suppose a consumer is choosing how best to allocate $100 over two goods, X & Y. The price of good X is $2 and the price of good Y is $5. Suppose that the income elasticity of both goods is 0.39 and the cross price elasticity is -0.29.

a. In the space below, draw the budget constraint faced by the consumer. Label your axes and intercepts.

The budget constraint is a straight line, whose x intercept is 50 and with y intercept 20. The equation of the line is Y = 20 - .4X.

b. Now suppose income were to fall by $20. Starting from an equilibrium of X = 10 and Y = 16, illustrate a likely new equilibrium after the income fall. Explain your answer.

Since the income elasticity of both goods is positive, they are normal goods. This means as income falls, the amount consumed of both X & Y would fall – e.g. Y = 14 & X = 5. In a figure, this would be shown by a parallel inward shift of the budget constraint, with a new tangency of the indifference curve as the lower levels of both X & Y.

c. Starting from the original equilibrium with income of $100, illustrate what happens if the price of good X rises to $4. Show the final equilibrium and in your figure, label the substitution and income effects for both X & Y.

If the price of good X rises to $4, then the slope of the budget constraint becomes steeper – the line rotates inward from the Y intercept, now with X intercept 25. The cross-price elasticity of the two goods is negative, meaning they are complements. Your figure should show a new equilibrium with both X & Y at lower values, each with an income effect that lowers overall consumption.

d. Using what you found in part c., derive the demand curve for good X (assume that the relationship between price and quantity is linear and continuous).

Here you should use the first point on your demand curve as P = $2 and the Quantity for good X that you started off the question in part c. Then, in part c, you show that with a price of $4 the Quantity of good X falls. The combination of that quantity and a P = $4 is the other point on your demand curve.