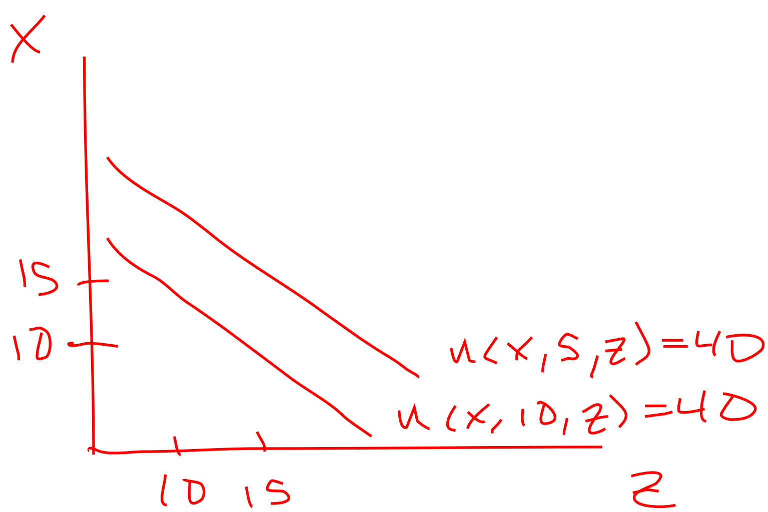
Economics 308: Intermediate Microeconomics
Department of Economics, Finance and Legal Studies
University of Alabama
Spring, 2020

Final – Version 001-1 – Answer Key

The exam is worth 100 points. Each question (eight questions on eight pages) is of equal value.

1. Suppose a consumer gains utility from three goods (x, w and z) and faces the utility function u(x, w, z) = x + 2w + z. Assume w is fixed at 5 units. Draw the indifference curve for u = 40 (show one relevant consumption bundle on the indifference curve). What is the marginal rate of substitution of x for z? Suppose w increases to 10 units. On the same graph, draw the indifference curve for u = 40 (show one relevant consumption bundle on the indifference curve). What is the marginal rate of substitution of x for z now?

$u(x, w=5, z) = x + 2 \cdot 5 + z = 10 + x + z$



$u(15,5,15) = 10+15+15 = 40$

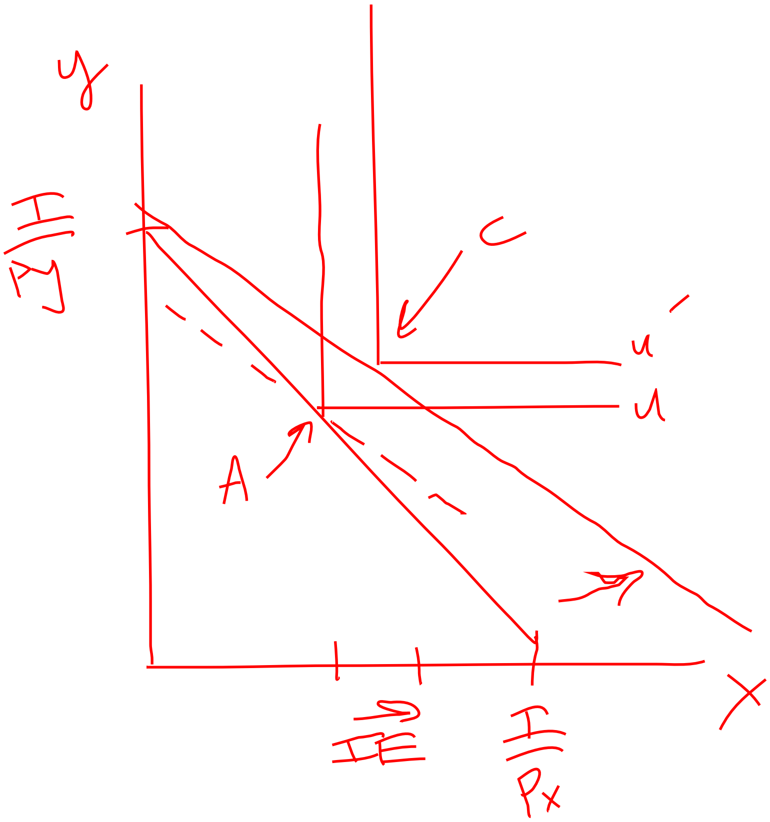
$MRS_{x,z} = \frac{MU_z}{MU_x} = \frac{1}{1} = 1$

$u(x, w=10, z) = x + 2 \cdot 10 + z = 20 + x + z$

$u(10,10,10) = 20 + 10 + 10 = 40$

$MRS_{x,z} = \frac{MU_z}{MU_x} = \frac{1}{1} = 1$

2. Suppose a consumer gains utility from two goods (x and y) and faces the utility function u = min(x, y). Draw a potential budget constraint and show where the consumer would maximize their utility. Now, suppose the price of x falls. Show the new utility maximizing point on the same graph. Explain what happens via income and substitution effects.



there is no SE as we cannot ~~substitute~~ substitute between the two goods here (they must be in fixed proportions)

new prize ratio $-P_x'/P_y$ is also tangent at pt A

IE says more x (also more y as must be 1 to 1)

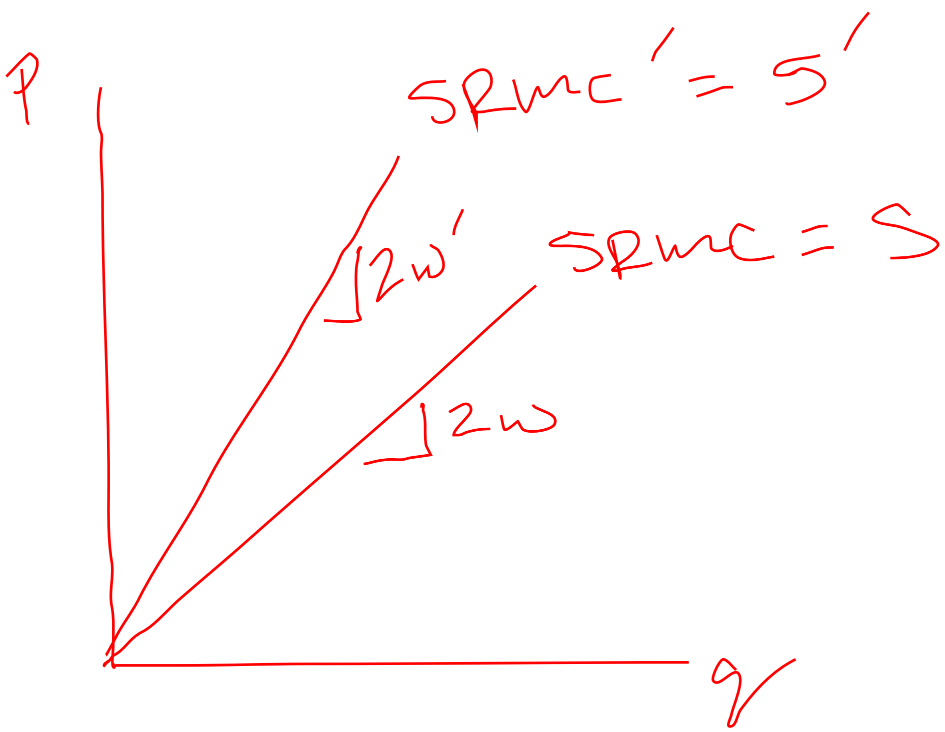
3. Consider the following production function: $q = L^{1/2}$, where L represents the amount of labor used by the firm. Suppose the firm is a price taker. Noting that the short-run marginal cost curve is the short-run supply curve for the firm, derive the short-run supply curve and plot it on a graph. Suppose there is an increase in wages (w), show the effect on the short-run supply curve.

$$TC = wL + rk$$

$$q = L^{1/2} \iff q^2 = L$$

$$TC = w(q^2) + r(0) = wq^2$$

$$MC = \frac{\partial TC}{\partial q} = 2wq$$



↑ w to w' ⇒ firms costs ↑ & they will want to produce less

4. Consider the following production function: $q = K^{1/2}/L^{1/2}$. Show whether this production function exhibits increasing, decreasing or constant returns to scale? What types of allocations of inputs (K & L) lead to maximal output (q)?

$$q(\lambda K, \lambda L) = \frac{(\lambda K)^{1/2}}{(\lambda L)^{1/2}}$$

$$= \frac{\lambda^{1/2} K^{\frac{1}{2}}}{\lambda^{\frac{1}{2}} L^{\frac{1}{2}}}$$

$$= \frac{K^{\frac{1}{2}}}{L^{\frac{1}{2}}}$$

(for $\lambda > 1$)

$$= q < \lambda q \Rightarrow \text{DRS}$$

output is max when the denominator (L) is small & K is large

suppose $L = 1 \Rightarrow q = K^{1/2}$

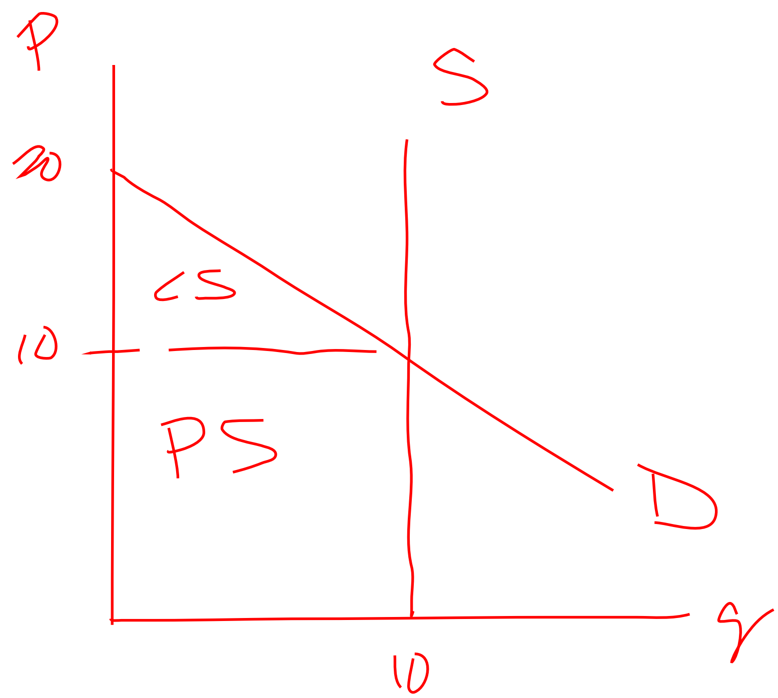
suppose $L = 0 \Rightarrow q = \infty$

5. Suppose we are in the very short-run and the supply of a good is fixed at 10 units. Suppose the demand curve is p = 20 – q. Derive the equilibrium price and quantity. Calculate both the consumer and producer surplus in this situation. Use a graph.

SS: $q = 10$ $\Rightarrow$ $p = 20 - q = 10$

DD: $p = 20 - q$

$p^* = 10, \; q^* = 10$



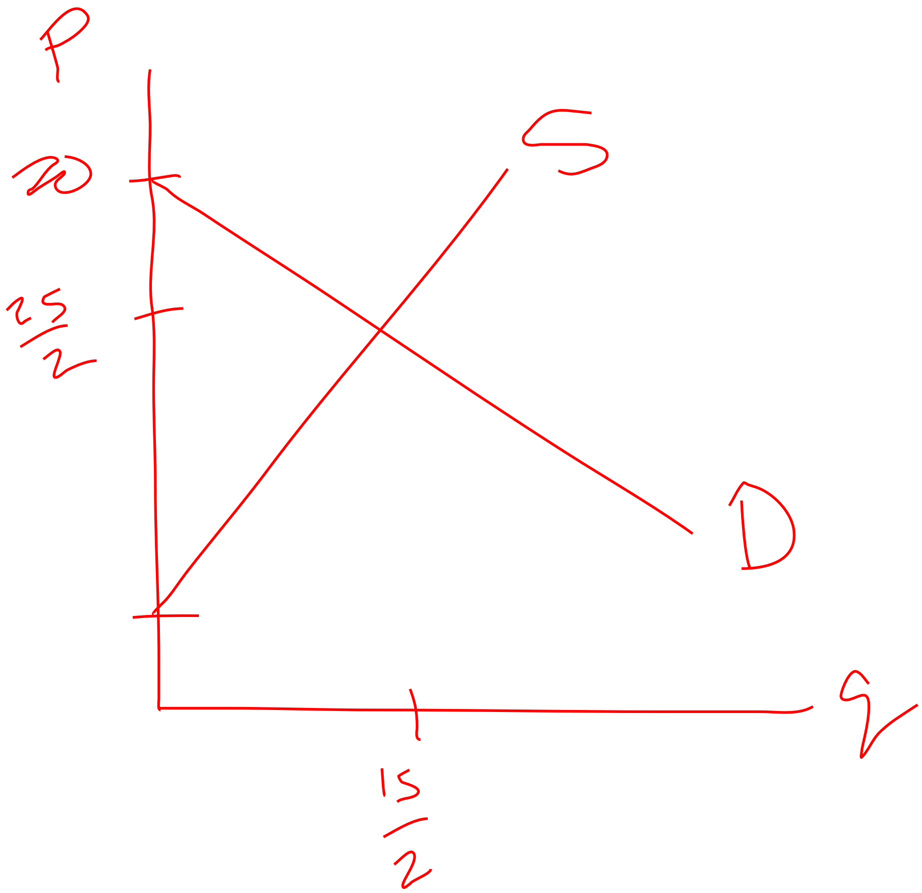
$CS = \frac{1}{2}(10)(10) = 50$

$PS = 10(10) = 100$

6. Suppose there are two firms in a market. The short-run supply curve for firm 1 is $p = 5 + 2q$ and the short-run supply curve for firm 2 is also $p = 5 + 2q$. What is the market supply curve in the short-run? If the market demand curve is given by $p = 20 - q$, what are the market equilibrium price and quantity? Use a graph and label the relevant axes, curves, etc.

SS: $p = 5 + q$

DD: $p = 20 - q$



$SS = DD$

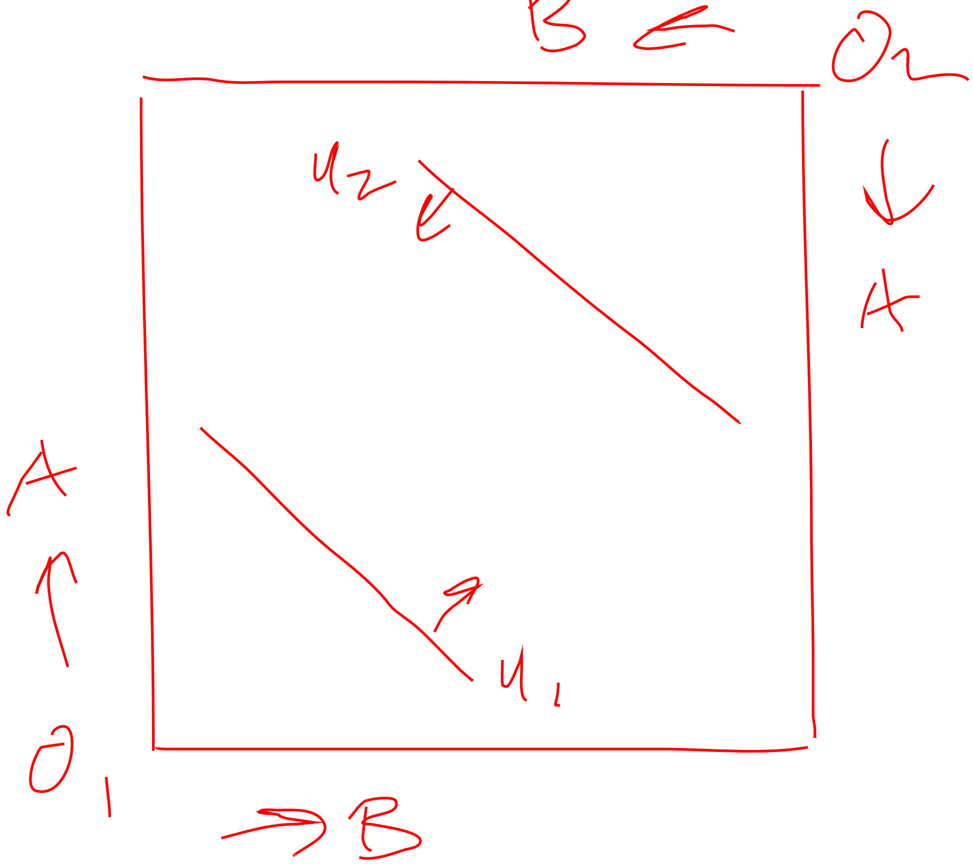
$5 + q = 20 - q$

$2q = 15$

$q^* = \frac{15}{2}$

$p^* = \frac{25}{2}$

7. Consider two consumers (1 and 2) who can consume two different goods (A and B). Suppose the utility function for the first consumer is $u_1(A, B) = A + B$ and the utility function for the second consumer is $u_2(A, B) = 2A + 2B$. Draw an Edgeworth Box for this situation. Draw a single indifference curve for each consumer in the box. What does the contract curve look like for this setting?



$MRS_1 = \frac{1}{1} = 1$

$MRS_2 = \frac{2}{2} = 1$

$MRS_1 = MRS_2$ always!

any allocation will be PO

$\Rightarrow$ the whole box is the contract curve

8. Suppose the demand curve that a monopolist faces is $p = 85 - q^2$, and suppose that their marginal cost is equal to their average cost and that value is 10. What is the profit maximizing level of output? What is the profit for the monopolist? Use a graph to help show your results.

$$DD: \; p = 85 - q^2$$

$$TR = pq = (85 - q^2)q = 85q - q^3$$

$$MR = \partial TR / \partial q = 85 - 3q^2$$

$$MR = MC$$

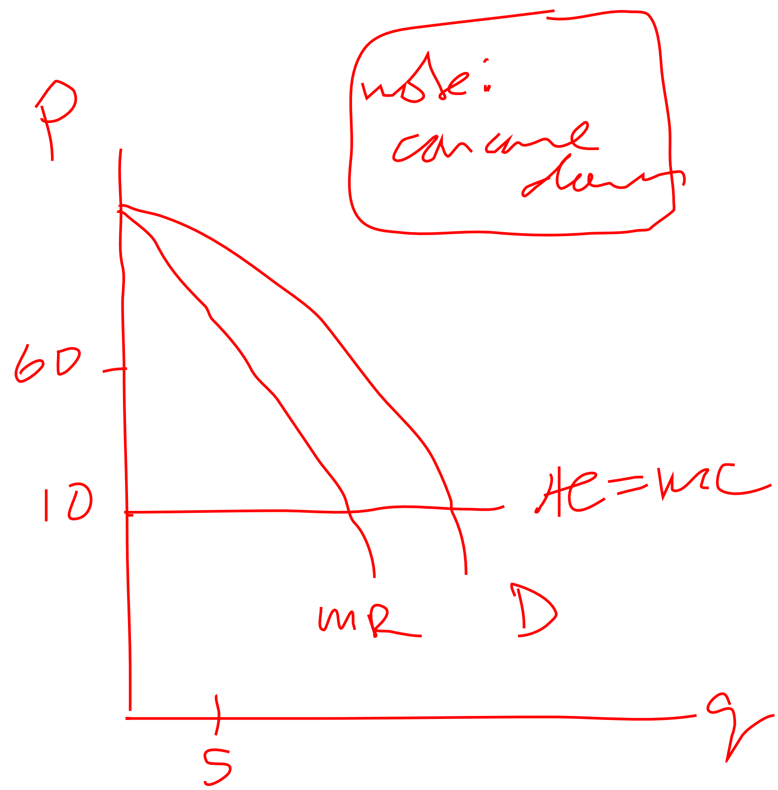
$$85 - 3q^2 = 10$$

$$75 = 3q^2$$

$$25 = q^2$$

$$q^* = 5$$

$$p = 85 - q^2 = 85 - 5^2 = 60$$



$$\pi = pq - ACq$$

$$= 60(5) - 10(5)$$

$$= 300 - 50$$

$$= 250$$