Homework #3
(Econ 512M)

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I. Assume that the (compensated) inverse demand and the supply curves are given by

$$\begin{aligned} P^c &= 15 - X, \\ P^s &= (1/2)X. \end{aligned}$$

(i) Draw these curves.

(ii) Suppose initially $P^c = P^s = 5$. Find the consumer and the producer surplus at this price.

(iii) Suppose the government gives a subsidy of \$3 per unit of output on the consumption of X. Find X, P^c and P^s.

(iv) Find the change in the consumer and in the producer surplus in going from (ii) to (iii) in above.

(v) Find the net welfare change in going from (ii) to (iii). Indicate whether this is a gain or a loss.

II. Determine which of the following functions are homogeneous in K and L and if they are of what degree.

(i)

$$y = K + L.$$

(ii)

$$y = KL.$$

(iii)

$$y = K^2/L + L - L^3/K^2.$$

(iv)

$$y = (K - \alpha)(L - \beta).$$

III. Consider the following CES production function.

$$y = [aL^{\gamma} + bK^{\gamma}]^{\frac{1}{\gamma}}.$$

(i) Verify that this function exhibits constant returns to scale (is homogeneous of degree one in K and L).

(ii) Verify the Euler's theorem for this function.

(iii) Verify that in this case the marginal product of labor and the marginal product of capital are homogeneous of degree zero in K and L.

(iv) Apply Euler's theorem to the marginal products of capital and labor in this case.

IV. Show, within the context of a one-sector general equilibrium model, that when individuals are on their budget constraints, the government's budget constraint is satisfied and the economy's resource constraint is satisfied, the value of the country's exports must be equal to its imports.

V. In the context of a two sector general equilibrium model show that taxing factors of production uniformly in one industry is equivalent to taxing the output of that industry.

VI. Assume a monopoly faces a linear demand curve given by $q = 45 - p$, where q is quantity and p the consumer price. [This means that marginal revenue function is $MR = 45 - 2q$]. Marginal cost, MC, of producing the output is \$5. By how much the consumer price will go up if we levy a \$2 tax on this good?

VII. State True or False and then explain.

(i) Assume capital is perfectly mobile. Then taxation of capital in x will not affect owners of capital in y.

(ii) Imposition of an annual tax on land affects both present and future owners of land.