Instructions: Your score will be based on how you show your work.

Student ID _____ Sol'n (1/2)

Question 1 (15 points): Consider the market for good x. Suppose that the market demand equation is given by

$$P_x = 8 - bQ_x^d + cP_y; \quad b > 0 \text{ and } c > 0$$

and the equation for market supply is given by

$$P_x = 20 + dQ_x^S; \quad d > 0$$

where P_x is price of good X, P_y is price of good Y, Q_x^d is quantity demanded for good X and Q_x^S is quantity supplied for good X. Answer the following questions.

2.1) (*2 points*) What is(are) the endogenous variable(s) in the model? What is(are) the exogenous variable(s) in the model?

2.2) (*5 points*) Specify condition(s) under which the market equilibrium for good x is guaranteed to exist. What restrictions do we need to place on the values of P_y so that the market equilibrium exists?

2.3) (*5 points*) Solve for the equilibrium price (P_x^*) and equilibrium quantity (Q_x^*) of the market for good x.

2.4) (*3 points*) Calculate the magnitude of the response of equilibrium quantity to the change in exogenous variable(s).

① Endo: P_x, Q_x^d, Q_x^S → to be solved for
Exo: P_y (treated as given / B/c we consider Market x and this is a single market model.)

② $Q_x^d = 0$ when $P_x = 8 + cP_y$ → max Price of Consumer
$Q_x^S = 0$ when $P_x = 20$ → min Price of Producer. Min
∴ Market exists If max Price of Consumer > ~~Max~~ Price of Produc
i.e. $8 + cP_y > 20$
→ restriction is that $P_y > \frac{12}{c}$

③ Solution: Equ'l occurs when $Q_x^d = Q_x^S = Q^* = Q$
$8 - bQ + cP_y = 20 + dQ$ (use Supply Equation)
$(P_y > \frac{12}{c})$ ∴ $Q^* = \frac{cP_y - 12}{b+d}$; $P^* = 20 + d\left(\frac{cP_y - 12}{b+d}\right)$
Note that with conditions: $Q^* > 0$; $P^* > 0$

Instructions: Your score will be based on how you show your work.

Student ID _____ Sol'n (2/2)

Question 1 (15 points): Consider the market for good x. Suppose that the market demand equation is given by

$$P_x = 8 - bQ_x^d + cP_y; \quad b > 0 \text{ and } c > 0$$

and the equation for market supply is given by

$$P_x = 20 + dQ_x^S; \quad d > 0$$

where P_x is price of good X, P_y is price of good Y, Q_x^d is quantity demanded for good X and Q_x^S is quantity supplied for good X. Answer the following questions.

2.1) (*2 points*) What is(are) the endogenous variable(s) in the model? What is(are) the exogenous variable(s) in the model?

2.2) (*5 points*) Specify condition(s) under which the market equilibrium for good x is guaranteed to exist. What restrictions do we need to place on the values of P_y so that the market equilibrium exists?

2.3) (*5 points*) Solve for the equilibrium price (P_x^*) and equilibrium quantity (Q_x^*) of the market for good x.

2.4) (*3 points*) Calculate the magnitude of the response of equilibrium quantity to the change in exogenous variable(s).

(4) Based on $Q^* = \frac{cP_y - 12}{b+d}$

$\therefore Q^* = \frac{c}{b+d} \cdot P_y - \frac{12}{b+d}$

$\frac{\Delta Q^*}{\Delta P_y} = \frac{c}{b+d} > 0$ ($c>0$; $b>0$, $d>0$ from the assumptions given in the question.)

$\therefore P_y \uparrow \rightarrow Q^* \uparrow$

Why?? x and y are substitute products

$P_y \uparrow \rightarrow Q_y \downarrow \rightarrow Q_x \uparrow$ (from demand) $\therefore$ $P_y \uparrow \rightarrow$ Demand for x $\uparrow \rightarrow P_x^* \uparrow, Q_x^* \uparrow$