EC 501   **Midterm Exam**   **Oct 30, 2015**

Answer all questions, showing all your work. Try to use diagrams wherever possible. Time allowed: 1 hour 30 minutes. Good luck! (Each question is worth 25 points.)

(25) 1. John's quasi-linear utility function is
$$U(x, y) = x + \ln y$$
where x, y are the quantities consumed per month of the only two goods he buys.

(a) Find John's demand functions for x and y.
(b) If John's income is $100 per month and p_x = $20 and p_y = $5, how much of each good would John buy per month?
(c) Find John's compensated demand function for x.
(d) Using your answers to (a) and (c), verify the elasticities form of the Slutsky equation for x.

(25) 2. Bill is a utility maximizer, and his utility function is $U = yT$, where y = quantity of "goods" consumed per day and T = non-working hours per (24-hour) day. The price of "goods" is $1 per unit.

(a) Let the wage rate be $4 per hour. How many hours will Bill work? How much will he earn?

(b) Suppose a welfare system is introduced. It pays a daily benefit of $30, but for each $1 of wage income you earn, you lose 50 cents of the benefit. So if your wage income is $60, you get zero benefit. Draw a diagram showing Bill's original constraint, and his constraint under the welfare system. Then use your graph and the concepts of income and substitution effects to analyze what you might predict will be the effect of the welfare system on the number of hours Bill will choose to work. *(Do not refer to Bill's specific utility function.)*

(c) Calculate for Bill's utility function how many hours he will choose to work under the welfare system. Also find what his total income is, including any welfare benefit.

(25) 3. Suppose Widget Corp. has the production function
$$q = \frac{KL}{K + L}$$

(a) Assuming this firm is a price-taker, find its cost function.
(b) If every firm in the widget industry has this same production function and behaves as a price-taker, and the factor prices are $w = 4, r = 9$, what will be the long run supply curve of widgets?
(c) If the market demand for widgets is
$$Q = 200 - 2p$$
what will be the equilibrium price and quantity traded of widgets?

(25) 4. The demand for widgets is given by
$$Q_d = 40 - 2p$$
where Q_d is the number of widgets demanded (in millions) and p is their price per unit. The domestic supply of widgets is given by
$$Q_s = \frac{2}{3}p$$
where Q_s is the number of widgets supplied (in millions). Widgets can also be freely imported at a price of $9 per widget. In addition, there is an import tariff on widgets of $9 per unit.

(a) What would be the equilibrium price of widgets, the quantity produced domestically and the quantity imported?
(b) Suppose that, under the terms of a new free trade agreement, the government plans to eliminate the import tariff on widgets. What would now be the equilibrium price of widgets, the quantity produced domestically and the quantity imported?
(c) Who gains and who loses from the free trade agreement and by how much? How much better off or worse off is society as a result?