

Midterm Exam*

Thursday, April 9

75 minutes

Name: _____

Instructions

1. This is closed book, closed notes exam.
2. No calculators of any kind are allowed.
3. Show all the calculations.
4. If you need more space, use the back of the page.
5. Fully label all graphs.

Good Luck ☺

1. (40 points). Consider the Classical model studied in class, and briefly described as follows. The consumer derives utility from consumption C and leisure l according to $U(C,l) = \alpha \ln C + (1 - \alpha) \ln l$. He is endowed with h hours which he can allocate between leisure and work L_S . The real wage is w . The consumer owns a firm and receives dividend income (profit) π . The firm produces output Y using technology $Y = AK^\theta L_D^{1-\theta}$, where A is productivity parameter (TFP), K is the capital owned by the firm, and L_D is labor employed by the firm. The government taxes labor income at the rate of t_w and dividend income at the rate of t_π .

- a. (5 points). Write the consumer's problem.

$$\begin{aligned} & \text{Consumer's problem} \\ & \max_{C,l} \alpha \ln C + (1 - \alpha) \ln l \\ & \text{s.t.} \\ & C = w(h - l)(1 - t_w) + \pi(1 - t_\pi) \end{aligned}$$

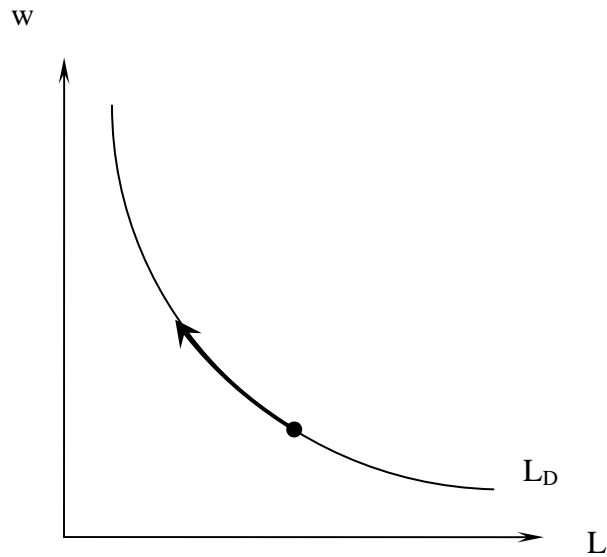
- b. (5 points). Write the firm's problem.

$$\max_{L_D} \pi = AK^\theta L_D^{1-\theta} - wL_D$$

- c. (5 points). Derive the firm's demand for labor.

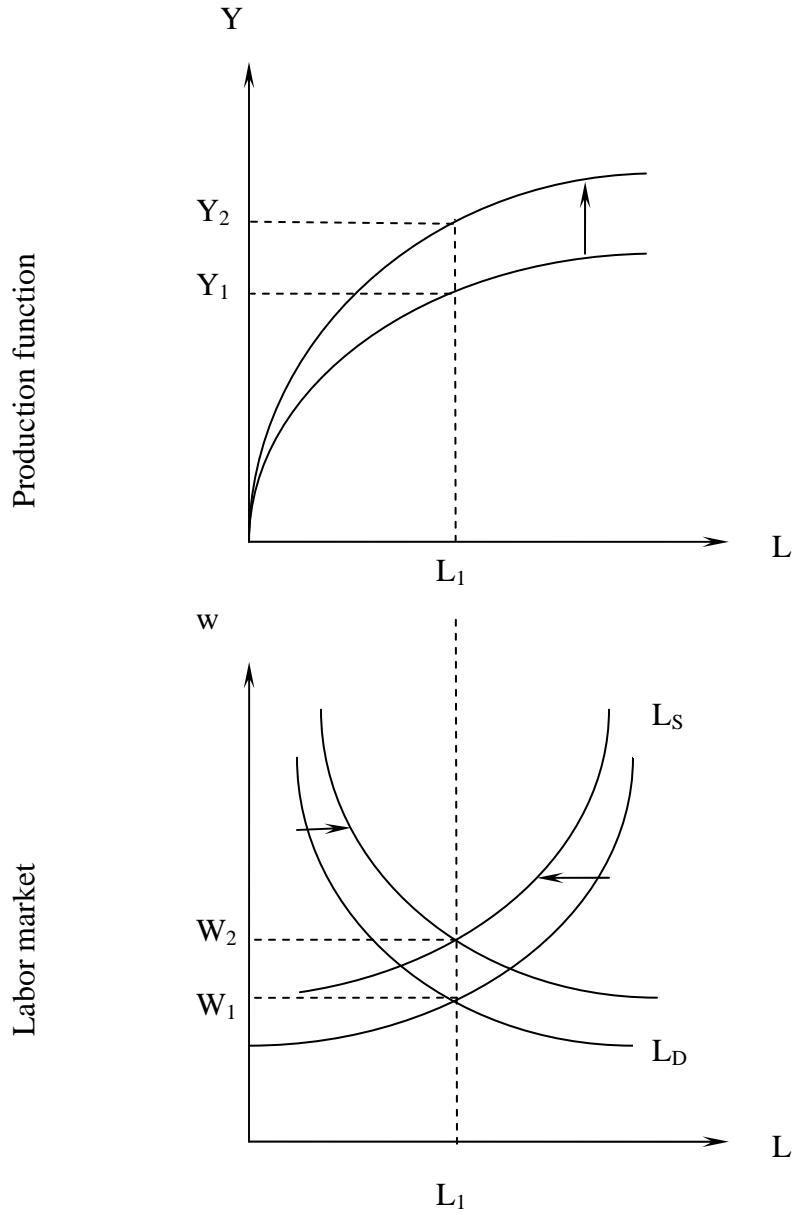
$$\begin{aligned} \frac{\partial \pi}{\partial L_D} &= (1 - \theta)AK^\theta L_D^{-\theta} - w = 0 \\ L_D &= \left(\frac{(1 - \theta)AK^\theta}{w} \right)^{1/\theta} \end{aligned}$$

- d. (5 points). Illustrate graphically the impact on the labor demand curve of an increase in real wage, and provide economic intuition for it.



With higher wage, the firm wants to employ less labor. Remember that competitive firm employs labor up to the point where the marginal product of labor is equal to the wage. Since the marginal product is decreasing, higher wage can be paid only when less workers are employed.

- e. (10 points). Using fully labeled graphs of the production function and labor market, illustrate the effect of productivity growth ($A \uparrow$) on equilibrium output (Y^*), equilibrium real wage (w^*) and equilibrium employment (L^*).



2. (5 points). In the classical model, unemployment rate is (circle the correct answer):
- a. always zero
 - b. always positive
 - c. can be positive
 - d. none of the above
3. (5 points). **"In the classical model the government cannot affect output and employment with fiscal policies"**. This statement is (circle the correct answer):
- a. always true
 - b. true if labor and non-labor income are taxed at different rates
 - c. true if labor and non-labor income are taxed at the same rate
 - d. never true

4. (15 points). Consider the Keynesian model discussed in class. Suppose that the economy is characterized by the following behavioral functions:

Consumption: $C = 10 + 0.5(Y - T)$

Investment: $I = 40$

Government spending: $G = 30$

Taxes: $T = 10 + 0.5Y$

Full employment output: $Y_f = 107$

- a. Solve for the Keynesian equilibrium in the goods market.

$$\begin{aligned}
 Y &= E \\
 Y &= 10 + 0.5(Y - 10 - 0.5Y) + 40 + 30 \\
 Y &= 10 - 0.5 \cdot 10 + 70 + 0.5 \cdot (1 - 0.5)Y \\
 Y^* &= \frac{75}{0.75} = 100
 \end{aligned}$$

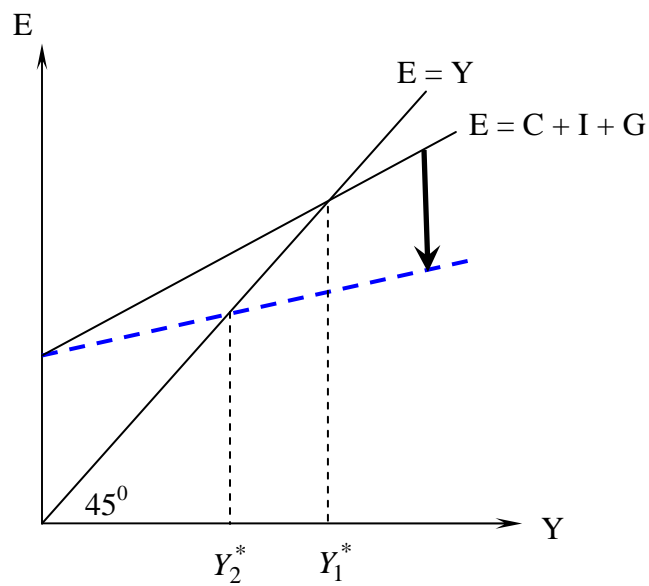
- b. Find the personal saving in equilibrium.

$$DI = Y - T = 100 - 10 - 0.5 \cdot 100 = 40$$

$$C = 10 + 0.5 \cdot DI = 30$$

$$\Rightarrow S_P = DI - C = 10$$

- c. On a fully labeled graph illustrate the Keynesian equilibrium in the goods market before and after an increase in proportional tax rate. No numbers are required.



5. (15 points). The following table contains data from the labor market of some country (in millions).

| | |
|--------------------------------------|-----------|
| Civilian noninstitutional population | 100 |
| Civilian labor force | 70 |
| Employed | 63 |
| Unemployed | 7 |
| Not in the labor force | 30 |

- a. Complete the above table.
b. Find the unemployment rate in this country.

$$\text{Unemp. Rate} = \frac{\#Unep}{\#Labor Force} = \frac{7}{70} = 0.1 = 10\%$$

- c. Find the labor force participation rate in this country.

$$\text{Labor Force Participation rate} = \frac{\#Labor Force}{\#Civilian Noninst. Pop.} = \frac{70}{100} = 0.7 = 70\%$$

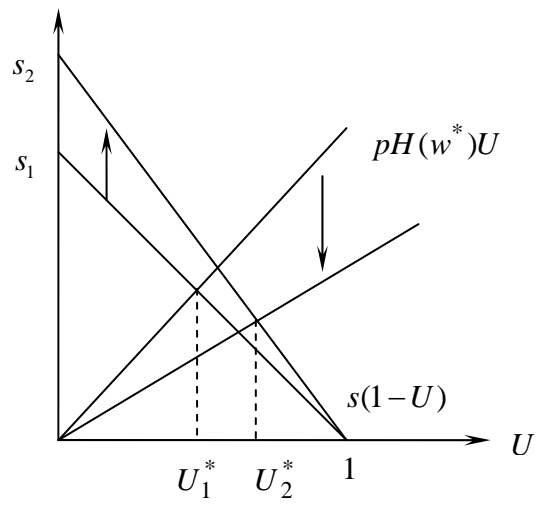
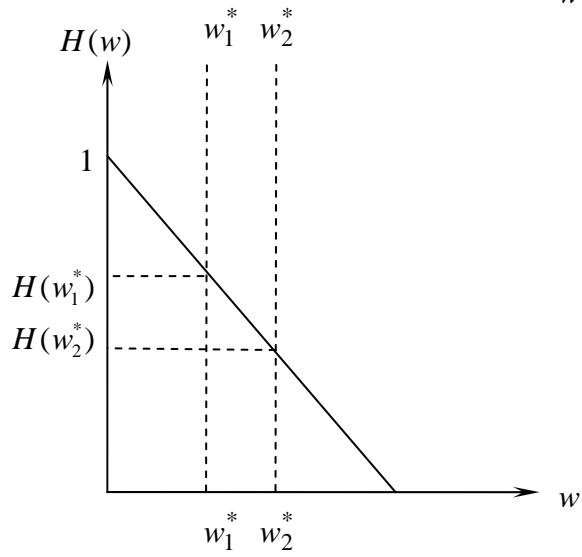
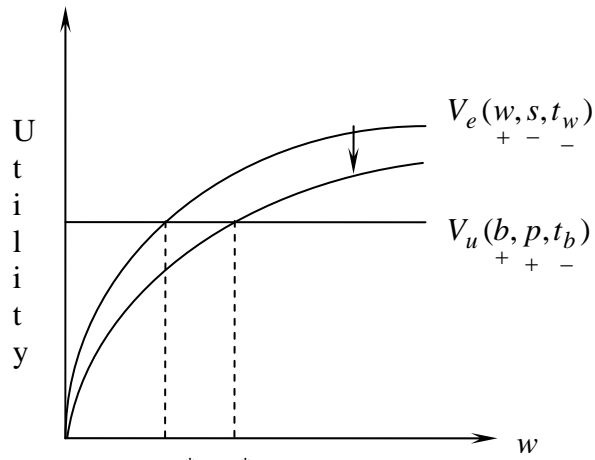
6. (15 points). Consider the search model of unemployment, briefly described as follows.

| | Unemployed | Employed |
|-------------------------------|--|--|
| Fraction in population | U | $1 - U$ |
| Utility | $V_u(b, p, t_b)$ + + - | $V_e(w, s, t_w)$ + - - |
| | b – unemployment insurance benefit p – probability of receiving a job offer t_b – tax on b | w – real wage s – separation rate (probability of losing the job) t_w – tax on w |

The symbols “+” under variable of the utility function indicates the assumption that the utility is increasing in that variable, and “-” under a variable indicates that the utility is decreasing in that variable.

Distribution of wage offers: $H(w)$ gives the probability that an offer is at least w .

Illustrate with 3 fully labeled graphs the impact of an increase in separation rate ($s \uparrow$) on: (1) reservation wage w^* , (2) probability of acceptance of job offers $H(w^*)$, and (3) steady-state unemployment rate U^* .



7. (10 points). Suppose that in some economy the private saving is 100, the domestic investment is 100, and the trade deficit is 11. What must be the government budget deficit in that country? Show your calculations.

$$\underbrace{S_P}_{100} + \underbrace{S_G}_{?} = \underbrace{I}_{100} + \underbrace{NX}_{-11}$$
$$S_G = -11$$

Government budget deficit is **11**.