

Whitman College  
Econ 308  
Exam 1  
February 12, 2010

Write all of your answers in your blue book. **Show all of your work.** The exam ends at 2:20.

1. (a) (5pts) Define Gross Domestic Product (GDP).

(b) (15pts) In January 2010, the unemployment rate in the United States was 9.7%. The 2010 Economic Report of the President predicts that real GDP in the United States will grow by 3.2% over the year 2010. According to Okun's Law, exactly what would happen to the U.S. unemployment rate if real GDP were to grow by the predicted 3.2% over the coming year? Be precise in your answer and explain your work.

2. Suppose that an economy has a Cobb-Douglas production function and perfectly competitive markets.

(a) (5pts) Draw a graph showing the real aggregate output this economy could produce at various levels of capital, assuming it has a constant supply of labor. Be sure to label your axes.

(b) (5pts) Define the marginal product of capital. Explain how to use your graph from part (a) to determine the marginal product of capital at a particular quantity of capital,  $K_1$ . On your graph, indicate  $K_1$  and the marginal product of capital at  $K_1$ .

(c) (10pts) With quantity of capital on the horizontal axis and the rental price of capital on the vertical axis, derive a curve that shows the highest amount firms would be willing to pay for capital. Explain how you derived this demand curve for capital, and be sure to define any terms that you use.

(d) (10pts) Suppose the quantity of labor increased, with all else unchanged. Explain what would happen to the demand curve for capital. How does the increase in labor change the equilibrium rental price of capital? Refer to a new set of graphs in your explanation.

3. (10pts) Consider the Cobb-Douglas production function  $Y = A K^\alpha L^{1-\alpha}$ , where  $Y$  is real aggregate output,  $A > 0$  is a parameter measuring the productivity of the available technology,  $K$  is the amount of capital employed,  $L$  is the amount of labor employed, and  $\alpha$  is a fraction between 0 and 1. Under perfect competition, what is the share of national income earned by capital owners? Prove that this is the share of national income earned by capital owners.

Consider the Cobb-Douglas production function where real aggregate output  $Y$  is given by  $Y = A K^\alpha L^{1-\alpha}$ , in which  $A=5$  is a parameter measuring the productivity of the available technology,  $K$  is the amount of capital employed,  $L$  is the amount of labor employed, and  $\alpha=0.2$ . Suppose that currently  $K=200$ ,  $L=10$ , and the price level,  $P$ , is 100. The savings rate,  $s$ , is 0.25. The depreciation rate,  $\delta$ , is 0.1. Assume that the population remains constant and that there is no change in the production technology. Use this information and the Solow Growth Model to answer Questions 4, 5 and 6. As you work these problems, don't round off your calculations in the intermediate steps.

4. (5pts) What is the current real consumption per worker ( $c=C/L$ )?

5. (15pts) What is the steady-state amount of real consumption per worker,  $c^*$ ?

6. Suppose policy-makers are contemplating trying to convince the people in this economy to save at the golden rule savings rate.

(a) (10pts) What is the golden rule savings rate for this economy?

(b) (5pts) If the savings rate in this economy were to change immediately to the golden rule savings rate, what would current real consumption per worker,  $c$ , be?

(c) (5pts) How easy do you think it would be to convince people in this economy to save at the golden rule savings rate? Explain your reasoning.