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**Macroeconomics**

Study Question: Long Run Closed Economy

1. An economy has aggregate production function  $Y = AK^aN^b$   
 The economy has a business tax rate of 40%, a constant interest rate of 4%, and a constant depreciation rate of 20%. Each unit of capital costs \$10.

And  $A = 10$ ,  $N = 100$ ,  $a = .4$  and  $b = .6$ , and  $p = 1$

- a) Calculate GDP when  $K = 10$ ,  $K = 100$ , and  $K = 1000$
- b) Calculate MPK when  $K = 10$ ,  $K = 100$ , and  $K = 1000$
- c) What is the equilibrium level of capital used in this economy? (Hint: it is either  $K=10$ ,  $K = 100$ , or  $K = 1000$ ). Demonstrate your answer with a calculation.
- d) Calculate the marginal product of labor at the equilibrium level of capital.

2. In a hypothetical closed economy,  
 $C^d = 200 + .8(Y-T)$ ,  $I^d = 2000 - 100r$ ,  $G = 500$ , and  $T = .25Y$ . We also hypothesize that the full employment level of GDP is 5000.

Calculate

- a) the full employment expected real interest rate
- b) C
- c) private savings
- d) government savings
- e) national savings
- f) investment

1. a)

398.1071706

1000

2511.886432

b)

15.92428682

4

1.004754573

c) At  $K = 100$  the MPK equals the user cost of capital = 4.

d) 6

e) 4

2.

a) We need equations for the savings curve and the investment curve

We already have the investment curve equation:  $I^d = 2000 - 100r$ Now let's get the savings curve:  $S^d = Y - C - G$ 

$$S^d = 5000 - (200 + .8(Y-T)) - 500$$

$$S^d = 4300 - .8(5000 - .25Y)$$

$$S^d = 4300 - 4000 + .2(5000)$$

$$S^d = 1300 \text{ (answer to part (e))}$$

In this economy,  
notice that the  
interest rate does  
not affect the  
level of savings

Now let's set savings equal to investment to get the expected real interest rate:

$$S^d = I^d$$

$$1300 = 2000 - 100r$$

$$100r = 700$$

$$r = 7$$

b)  $C = 200 + .8(Y-T) = 200 + .8(5000 - .25(5000)) = 3200$

c) private savings =  $Y - T - C = 5000 - 1250 - 3200 = 550$

d) government savings =  $T - G = 1250 - 500 = 750$

e) national savings =  $550 + 750 = 1300$

f) investment =  $2000 - 100(7) = 1300$

check:  $Y = C + I + G?$   $3200 + 1300 + 500 = 5000!$  Yes!