

Midterm Solution Key – test form A  
Economics 101 (Fall 2007)

**Regrade policy:** If you would like your test regraded, please submit a written statement to explain why. Your entire test will be regraded, so there is a possibility that points could be lost rather than gained.

**Multiple Choice:**

- 1) d   2) c   3) b   4) a   5) b   6) b   7) c   8) d

**Problem 1: Neoclassical Model of Factors Market**

- a)  $W/P = MPL = 3(K/L)^{1/4} = 4(100/100)^{1/4} = \underline{3}$   
 $R/P = MPK = 1(L/K)^{3/4} = (100/100)^{3/4} = \underline{1}$   
 Payments to labor =  $MPL * L = 3 * 100 = \underline{300}$
- b) Rise in L lowers MPL and so lowers real wage. It raises MPK so raises real rental rate. It raises  $MPL * L = 3(K/L)^{1/4} * L = 3K^{1/4}L^{3/4} = \frac{3}{4}Y$ , so it raises total payments to labor. (total payments to labor here is a constant fraction of GDP, so it rises when GDP rises). (b,a,a)
- c) Fall in K lowers MPL and so lowers real wage. It raises MPK so raises real rental rate. It lowers  $MPL * L = 3(K/L)^{1/4} * L = 3K^{1/4}L^{3/4} = \frac{3}{4}Y$ , so it lowers total payments to labor. (b,a,b)
- d) Yes. Yes. Output increases at the same rate as the factors only if both factors are increasing. If only one factor increases, output increases at a progressively slower rate.

**Problem 2: Neoclassical Model**

- a)  $Y^s = 10 \times 100 + 6 \times 100 = \underline{Y = 1600.}$   
 $Y^d = C + I + G = [100 + 0.75(1600 - 400)] + [300 - 1000r] + 400$   
 setting  $Y^s = Y^d$ :  $1600 = 1700 - 1000r$   
 so  $-100 = -1000r$  so  $\underline{r = 0.10 \text{ or } 10\%}$   
 $I = 300 - 1000r = 300 - 1000(0.10) \quad \underline{I = 200}$   
 and  $C = 100 + 0.75(1600 - 400) \quad \underline{C = 1000.}$   
 So  $sp = Y - T - C = 1600 - 400 - 1000 \quad \underline{sp = 200.}$   
 $sg = T - G = 400 - 400 \quad \underline{sg = 0}$   
 $S = Y - C - G = 1600 - 1000 - 400 \quad \underline{S = 200}$

The key equilibrium condition in the goods/financial are supply of goods equals demand:  $Y = C + I + G$ . This can also be written as saving = investment, from the perspective of the financial market. The interest rate adjusts so that the demand for loanable funds (for investment) in the financial market equals the supply (saving).

- b) A rise in taxes will lower consumption, so it raises national saving ( $Y - C - G$ ). This will lower the real interest rate, and thereby encourage more investment. Private saving =  $Y - T - C = Y - T - (300 + 0.75(Y - T)) = 0.25(Y - T) - 300$ . So a rise in T will lower private saving in this model. (a,b,a,b)
- c) A rise in G lowers government saving and hence national saving. This raises the equilibrium real interest rate to maintain equilibrium in the financial market. This works by lowering investment to a level consistent with the lower supply of savings in the economy. There is

no impact on the level of production here, since this is determined by the supply of capital and labor in the economy. Private saving is unaffected, since there is no change in Y, T or C. (b,a,b,c)

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**Problem 3: Solow Growth Theory**

a) steady state:  $s f(k^*) = (\delta+n) k^*$

$$0.20 \times k^{*1/2} = 0.10k^*$$

$$k^{*1/2} = 0.5k^*$$

$$k^{*1/2} = 2 \quad \text{so } k^* = 4 \quad \text{capital per person is 4 in steady state}$$

$$y^* = k^{*1/2} = 2 \quad \text{so } \underline{\text{GDP}} = 2 \text{ in steady state.}$$

$$c^* = (1-s)y^* = 0.80 \times 2 \quad \text{so } \underline{\text{consumption}} = 1.6 \text{ in steady state.}$$

b) The golden rule shows what level of capital per person would lead to the highest possible level of consumption per person as a steady state. (It thereby gives the highest standard of living.) Use the golden rule condition:

$$\text{MPK} = \delta+n$$

$$.5k^{*1/2} = 0.10$$

$$k^{*1/2} = 0.2$$

$$k^{*1/2} = 5$$

$$k^{*\text{gold}} = 25$$

c) With a lower population growth rate the economy will have a new steady state, one with a higher level of income and consumption per person. The steady state is still characterized by zero growth in per person terms, so this remains at the level 0. (a, a, c)

d) A low saving rates means we are converging to a steady state with a low level of income and consumption per person. Raising the saving rate closer to the golden rule level would raise our long-run standard of living. On the other hand, if the saving rate is higher than the golden rule level, the large capital stock eats up too much of GDP to replace depreciated capital each year, and less is left over for consumption.