

### Problem Set B3

#### Econ 302 - Haworth

**Due date:** Tuesday, July 28 (by 11:59pm)

1. Assume the following production function:  $Y = AK^\alpha L^{1-\alpha}$   
where:  $A = 1$  and  $\alpha = 0.5$  (and  $Y =$  real GDP,  $K =$  capital,  $L =$  labor)

Let's also assume that:

$s = 0.4$  (where  $s =$  savings rate)  
 $\delta = 0.2$  (where  $d =$  depreciation rate)  
 $k = 16$  (where  $k = K/L$ )

- Are we at the steady state level of capital ( $k^*$ )?
- What is the steady state level of capital ( $k^*$ )?
- Are we at the Golden Rule Steady State value of  $k$ ?
- What value of  $s$  allows this economy to operate at the Golden Rule Steady State value of  $k$ ?  
What is the value of the Golden Rule Steady State value of  $k$ ?

e) Describe how consumption and investment will change over time as this economy adjusts and we converge on the Golden Rule Steady State value of  $k$ .

2. Assume that we have an economy where the quantity of labor is no longer fixed and that technological change is possible, and that we have the following production function:

$$Y = AK^\alpha(L \times E)^{1-\alpha}$$

where:  $A = 1$  and  $\alpha = 0.5$  (and  $Y =$  real GDP,  $K =$  capital,  $L =$  labor,  $E =$  efficiency of labor and  $L \times E =$  effective number of laborers)

a. Let's assume Country X has the following values for depreciation rate ( $\delta$ ) and technological progress ( $g$ ):  $\delta = 0.04$  and  $g = 0.02$ .

Explain how rapid increases in population growth affect this country's steady state level of capital versus an increase in the country's savings rate.

b. Assume that there is a second country, Country Y, and that Country Y has the same values for their depreciation rate and technological progress as Country X. Let's assume that Country X has a slow-growing population and high savings rate, vs Country Y which has a fast-growing population and low savings rate. Their respective values for these growth rates is as follows:

Country X	Country Y	
$s = 0.28$	$s = 0.10$	( $s =$ savings rate)
$n = 0.01$	$n = 0.04$	( $n =$ population growth rate)

Given these values for  $s$  and  $n$  in each country, how much output per effective laborer does each country produce when operating at the steady state level of capital?