

### ECON 256: Midterm Practice Math/Formula Questions

1. Suppose a country has a population of 20 million people and a GDP of 1 billion dollars. What is the GDP per capita of the country?
2. Use the following formula:  $\text{Total Growth} = 100 \times \left( \left( \frac{100+r}{100} \right)^N - 1 \right)$ . If the growth rate is 10 percent, what will total growth be after 2 years? (Reported as percentage and rounded to nearest integer)
3. Consider the production function  $Y = K^{0.5}L^{0.5}$ . How much output do we get if  $K = 9$  and  $L = 4$ ?
  - A. 6.5
  - B. 5
  - C. 6
  - D. 9

The Dynamics of the Solow Growth Model are determined by the following two equations (I plugged in a savings rate of 10 percent, depreciation rate for capital of 10 percent, TFP=4, a capital share of 0.5):

$$\frac{K_{t+1}}{L_{t+1}} = (1 - 0.10) \frac{K_t}{L_t} + 0.10 \frac{Y_t}{L_t}$$

$$\frac{Y_t}{L_t} = 4 \left( \frac{K_t}{L_t} \right)^{0.5}$$

4. Suppose  $\frac{K_0}{L_0} = 9$ , what is  $\frac{Y_0}{L_0}$ ? Use the above equations for the Solow Growth Model.
5. Suppose  $\frac{K_0}{L_0} = 9$ , what is  $\frac{K_1}{L_1}$ ? Use the above equations for the Solow Growth Model.

6. In the Solow Growth Model, steady state output per worker is given by the equation

$$\frac{Y}{L} = A^{\frac{1}{1-\alpha}} \left(\frac{s}{\delta}\right)^{\frac{\alpha}{1-\alpha}}$$

Suppose  $s = 0.4$ ,  $\delta = 0.2$ ,  $\alpha = 0.5$ , and  $A = 5$ . What is  $\frac{Y}{L}$ ?

7. The Law of Motion for Capital is

$$K_{t+1} = (1 - \delta)K_t + I_t$$

Suppose  $K_0 = 0$ , the depreciation rate is 10 percent, and investment each period is always equal to 100. What is  $K_2$ ?

8. If we have a standard Cobb-Douglas production function, and a firm faces a capital wedge,  $\tau^k$ , (unobserved cost that acts as a tax or subsidy to capital costs), then efficiency implies that

$$\frac{\alpha}{1 - \alpha} = \tau^k \frac{rK}{wL}$$

(subscripts suppressed here compared to the slides since we only have 1 firm). Suppose that the capital wedge is  $\tau^k = 2$ , and  $\alpha = \frac{1}{3}$ . What should the capital labor ratio,  $rK/wL$ , be according to the above formula?