

Macro I. Quiz 2. Name: \_\_\_\_\_

1. Throughout this question assume that the production function is  $Y = K^{0.4}L^{0.6}$

(a) (1 point) Show that the production function is increasing in K and L

**Solution:**

$$\frac{\delta Y}{\delta K} = 0.4K^{-0.6}L^{0.6} > 0$$

$$\frac{\delta Y}{\delta L} = 0.6K^{0.4}L^{-0.4} > 0$$

(b) (1 point) Show that the production function exhibits constant returns to scale in  $\{K, L\}$

**Solution:**

$$F(\lambda K; \lambda L) = (\lambda K)^{0.4}(\lambda L)^{0.6} = \lambda^{(0.4+0.6)}K^{0.4}L^{0.6} = \lambda F(K; L)$$

(c) (1 point) Show that the production function exhibits diminishing returns in L

**Solution:**  $\frac{\delta Y}{\delta L} = 0.6K^{0.4}L^{-0.4}$

$$\frac{\delta^2 Y}{\delta L^2} = -0.4 \cdot 0.6K^{0.4}L^{-1.4} = -0.24K^{0.4}L^{-1.4} < 0$$

(d) (2 points) Suppose the supply of labor is fixed at  $\bar{L}$ . What would be the equilibrium wage  $w$ , if we assume that labor market is competitive?

**Solution:** In the competitive market wage is equal to the marginal productivity of labor.

$$w = \frac{\delta Y}{\delta L} = 0.6K^{0.4}L^{-0.4}$$

2. Consider the economy described by the following equations:

$$Y = C + I + G$$

$$Y = 3000$$

$$G = 500$$

$$T = 500$$

$$C = 100 + 0.6(Y - T)$$

$$I = 1500 - 50r$$

(a) (1 point) Compute private saving, public saving and total (national) saving.

**Solution:**

$$\text{Private saving: } Y - C - T = 3000 - (100 + 0.6(3000 - 500)) - 500 = 3000 - 1600 = 900$$

$$\text{Public saving: } T - G = 500 - 500 = 0$$

$$\text{Total: } S = 900 + 0 = 900$$

(b) (1 point) Compute equilibrium interest rate.

**Solution:** Investment should be equal to total saving:

$$900 = 1500 - 50r$$

$$50r = 600$$

$$r = 12$$

- (c) (2 points) Suppose  $G$  rises to 1000. Compute private saving, public saving and total (national) saving.

**Solution:** Private saving:  $Y - C - T = 3000 - (100 + 0.6(3000 - 500)) - 500 = 900$

Public saving:  $T - G = 500 - 1000 = -500$

Total:  $S = 900 - 500 = 400$

- (d) (1 point) Compute new equilibrium interest rate.

**Solution:** Investment should be equal to total saving:

$$400 = 1500 - 50r$$

$$50r = 1100$$

$$r = 22$$