Homework 1

Due on Sep 20

Choose the best answer

1. If more and more labor is employed while keeping all other inputs constant, the marginal physical productivity of labor will eventually
   a. increase.
   b. decrease.
   c. remain constant.
   d. cannot tell from the information provided.

2. The average productivity of labor reaches its maximum
   a. at the point of inflection of the total product curve.
   b. where the slope of the total product curve is steepest.
   c. where the slope of the total product curve is zero.
   d. where marginal and average productivity are equal.

3. The marginal rate of technical substitution (RTS) of labor for capital measures
   a. the ratio of total labor to total capital.
   b. the ratio of total capital to total labor.
   c. the amount by which capital input can be reduced while holding quantity produced constant when one more unit of labor is used.
   d. the amount by which labor input can be reduced while holding quantity produced constant when one more unit of capital is used.

4. For a fixed proportion production function, at the vertex of any of the (L shaped) isoquants the marginal productivity of either input is
   a. constant
   b. zero.
   c. negative.
   d. a value that cannot be determined.

5. Which production technology is the most flexible in replacing one input by another input in producing output q.
   a. Cobb-Douglas.
   b. Fixed-proportion.
   c. Linear.
   d. It depends on the level of q.

Analytical question

1. A car production company's production function is $f(k,l) = \alpha k^{0.5} l^{0.5}$ where k represents units of capital, l represents units of labor and $\alpha > 0$ represents technology.

a. Calculate the marginal product of capital and marginal product of labor.

b. In short run, capital is fixed. Show that the production function follows the law of diminishing return to labor.

c. In long run, capital can be adjusted. Determine this production function is constant, increasing or decreasing return to scale.

d. Compute the RTS and elasticity of substituton between k and l. Show this production function is homothetic.

2. Textbook exercise 9.2

3. Textbook exercise 9.3(a)-(c)

4. Textbook exercise 9.6

5. Textbook exercise 9.7

For part (c), we have the following modification and hint: (i) Treat $\beta_0 = 0$ and study the constant return-to-scale case. (ii) Use the formula in footnote 6. $\sigma = \frac{f_k f_l}{f \cdot f_{kl}}$.