Economics 301  
Spring 2005  
Problem set # 5: answers

Name: __________________________________________

1. The marginal product of capital is

1. (a) $MP_K = 3$
\( (b) MP_K = 2K^{-0.5}L \)
\( (c) MP_K = \frac{5}{2}K^{-0.5}L \)

2. The isoquants are “L” shaped, indicating perfect complementarity, and for every doubling of inputs, output also doubles. See Figure 1.

3. Perloff, Third edition, question 17 page 143
In order for him to be maximizing his utility, he must set his consumption such that the marginal utility per dollar ($MU/p$) of the last unit consumed is equal across commodities. In this case:

\[ \frac{10}{10} \neq \frac{5}{2} \]

Specifically, the marginal utility per dollar is greater for cookies. Therefore, he should decrease his consumption of books and increase his consumption of cookies.

4. Perloff, Third edition, problem 20 page 143
If the utility function is \( U = 10R^2C \), the marginal utility of spare ribs function is \( MU_R = \left( \frac{\partial U}{\partial R} \right) = 20RC \). To find the optimal bundle, set the marginal rate of substitution equal to the price ratio and substitute the resulting consumption ratio into the budget constraint, as shown below. See Figure 2.

\[
MRS = \frac{\frac{\partial U}{\partial R}}{\frac{\partial U}{\partial C}} = \frac{20RC}{10R^2} = \frac{2C}{R}
\]

\[
\frac{2C}{R} = \frac{10}{5}
\]

\[
C = \frac{R}{5}
\]

Substitute \( C = R \) into the budget constraint

\[
10R + 5C = Y
\]

and thus

\[
R^* = C^* = \frac{Y}{15}
\]

5. Perloff, Third edition, question 2 page 179

See Figure 3. After the sixth unit, marginal product of labor falls to zero. Total product remains at 6 units, and average product of labor falls after the sixth unit.
6. Perloff, Third edition, question 3 page 179
An indifference curve shows all combinations of goods that result in the same level of utility; an isoquant shows all the combinations of inputs that result in a given level of output.


\[ Q = L + K. \]