入学年度	学部	学 科		組		番 号			検	フリガナ
										氏 名

1 The production of a major computer manufacturer is given approximately by the production function

$$f(x, y) = 15x^{\frac{2}{5}}y^{\frac{3}{5}}$$

with the use of x units of labor and y units of capital. (The production function of the form $f(x, y) = ax^{\alpha}y^{\beta}$ is called the Cobb-Douglas product function.)

The partial derivative $\dfrac{\partial f}{\partial x}(x, y)$ represents the rate of change of production with respect to labor and is called the **marginal product of labor.** The partial derivative $\dfrac{\partial f}{\partial y}(x, y)$ represents the rate of change of production with respect to capital and is called **marginal product of capital.**

a) Compute the marginal product of labor and the marginal product of capital.

b) If the company is currently using 4,000 units of labor and 2,500 units of captial, find the marginal product of labor and the marginal product of capital.

c) For the greater increase in production, should the management of the company encourage increased use of labor or increased use of capital?

2 Consider the Cobb-Douglas production function $Q = 9L^{2/3}K^{1/3}$.

a) Compute partial derivatives $\frac{\partial Q}{\partial L}(L, K)$ and $\frac{\partial Q}{\partial K}(L, K)$

b) What is the output when $L = 1000$ and $K = 216$?

c) Use marginal analysis to estimate $Q(998, 216)$ and $Q(1000, 217.5)$.

d) Use a calculator to compute these two values of Q to three decimal places and compare these values with your estmates in b).

e) How big must ΔL be in order for the difference between $Q(1000 + \Delta L, 216)$ and its linear approximation, $Q(1000, 216) + \frac{\partial Q}{\partial L}(1000, 216)\Delta L$, to differ by more than two units? (Plug increasing valuew of ΔL into these two expressions.)