



# B.E. International Program

Faculty of Economics, Thammasat University



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EE 320 Introductory Mathematical Economics (Section 046401)

Semester 1/2015

## Quiz 3 (a) - Answers

Thursday October 29, 2015

Time: 11:15 – 11:35 hrs.

1. Given the production function

$$Q(K, L) = 30K + 15L - 2K^2 - KL - 2L^2$$

a. (2 points) Find the marginal product of capital ( $MP_K$ ) and the marginal product of labor ( $MP_L$ ).

$$\text{Ans. } MP_K = Q_K = 30 - 4K - L$$

$$MP_L = Q_L = 15 - K - 4L$$

b. (4 points) Find all the second-order partial derivatives, and write the Hessian matrix for the above function.

$$\text{Ans. } H = \begin{bmatrix} -4 & -1 \\ -1 & -4 \end{bmatrix}$$

2. (2 points) Find the total derivative  $\frac{dz}{dt}$ , given that

$$z = x^2 - 8xy - y^3, \text{ where } x = 3t \text{ and } y = 1 - t$$

$$\text{Ans. } \frac{dz}{dt} = \frac{\partial z}{\partial x} \frac{dx}{dt} + \frac{\partial z}{\partial y} \frac{dy}{dt} = (2x - 8)(3) + (-8x - 3y^2)(-1)$$

$$\frac{dz}{dt} = -14x - 24y + 3y^2 = 3t^2 + 60t - 21$$

3. (2 points) Given that  $F(y, x) = x^3 - 2x^2y + 3xy^2 - 22 = 0$  implicitly defines a function  $y = f(x)$ , find  $\frac{dy}{dx}$  when  $y = 3$  and  $x = 1$ .

$$\text{Ans. } \frac{dy}{dx} = -\frac{F_x}{F_y} = -\frac{3x^2 - 4xy + 3y^2}{-2x^2 + 6xy}$$

$$\text{At } (x=1, y=3), \frac{dy}{dx} = -\frac{18}{16} = -\frac{9}{8}$$