Economics 102: Problem Set 3

Due date: February 14 (Wednesday), 2007.

Note: you can either give your homework to me right after class or put it in the box outside my office (Heady 469) before 5:00pm.

Problem 1 Suppose an industry has the following production function:

\[ Y = F(K, L) = K^\sqrt{L} \]

(i) Holding capital constant at \( K = 1 \). Compute the marginal product of labor \( MPL(K, L) \) for \( L = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 \). Does \( MPL(K, L) \) decrease as \( L \) increases? In other words, does this production function exhibit diminishing marginal product of labor?

(ii) Does this production function have constant returns to scale? That is, suppose both \( K \) and \( L \) are increased by 10 percent, would output also increase by 10 percent?

(iii) Holding capital constant at \( K = 1 \). Suppose the industry hires 4 workers, can you infer from the equation \( MPL(K, L) = W/P \) the workers’ real wage?

(iv) Suppose the industry is experiencing a major technological innovation, and the new production function is

\[ F(K, L) = 2K^\sqrt{L}. \]

(a) How does this affect the marginal product of labor?

(b) Suppose the market real wage for the workers remains the same (as determined in (iii)). Does the industry want to hire more workers after the technological innovation? Why?