

Problem Definition

Problem 69. **Marginal Productivity** Let $x = 1000$ and $y = 500$ in the Cobb-Douglas productivity function given by

$$f(x, y) = 100x^{0.6}y^{0.4}$$

- (a) Find the marginal productivity of labor $\partial f/\partial x$.
- (b) Find the marginal productivity of capital $\partial f/\partial y$.

Solution Step 1:

For part (a) we need to compute the appropriate partial derivatives. These are

$$f_x = 100(0.6)x^{0.6-1.0}y^{0.4} = 60x^{-0.4}y^{0.4} = 60\left(\frac{y}{x}\right)^{0.4}$$

and

$$f_y = 100(0.4)x^{0.6}y^{0.4-1.0} = 40x^{0.6}y^{-0.6} = 40\left(\frac{x}{y}\right)^{0.6}$$

Solution Step 2:

The rest of the problem is to evaluate these two pieces at values of $x = 1000$ and $y = 500$. The values are

$$f_x(1000, 500) = 60\left(\frac{500}{1000}\right)^{0.4} = 60(0.5)^{0.4} \approx 45.47$$

for part (a) and

$$f_y(1000, 500) = 40\left(\frac{1000}{500}\right)^{0.6} = 40(2)^{0.6} \approx 60.62$$

for part (b).