

Practice Questions Econ 100

Find the partial derivatives for the following functions:

$$\textcircled{1} F(x,y) = \frac{\log(x^2)}{x \log y} \quad \textcircled{2} F(x,y) = 2xy^5 - \frac{x}{y} \quad \textcircled{3} F(x,y) = x^{-\frac{1}{3}} y^6$$

$$\textcircled{4} F(x,y) = \frac{2x^{\frac{1}{2}} y^{\frac{1}{2}}}{\log x} \quad \textcircled{5} F(x,y) = x^{-\frac{1}{3}} y^{\frac{4}{3}} \log(x^{\frac{2}{3}})$$

Find the total derivatives of $\textcircled{1}$ - $\textcircled{5}$

What is the slope of these functions in x,y space? i.e.

what is $\frac{dy}{dx}$ when $dF = 0$?

$$\textcircled{1} \frac{\partial F}{\partial x} = \frac{2 - \log x^2}{x^2 \log y} \quad \frac{\partial F}{\partial y} = \frac{-\log(x^2)}{xy(\log y)^2}$$

$$\textcircled{2} \frac{\partial F}{\partial x} = 2y^5 - \frac{1}{y} \quad \frac{\partial F}{\partial y} = 10xy^4 + \frac{x}{y^2}$$

$$\textcircled{3} \frac{\partial F}{\partial x} = -\frac{1}{3} x^{-\frac{4}{3}} y^6 \quad \frac{\partial F}{\partial y} = 6x^{-\frac{1}{3}} y^5$$

$$\textcircled{4} \frac{\partial F}{\partial x} = \left(\frac{y}{x}\right)^{\frac{1}{2}} \left[\frac{1}{\log x} - 2\right] \quad \frac{\partial F}{\partial y} = \left(\frac{x}{y}\right)^{\frac{1}{2}} \left(\frac{1}{\log x}\right)$$

$$\textcircled{5} \frac{\partial F}{\partial x} = \frac{1}{3} \left(\frac{y}{x}\right)^{\frac{4}{3}} \left[2 - \log x^{\frac{2}{3}}\right] \quad \frac{\partial F}{\partial y} = \left(\frac{y}{x}\right)^{\frac{1}{3}} \left(\frac{4 \log(x^{\frac{2}{3}})}{3}\right)$$

$$\text{Total Derivative} = dF = \frac{\partial F}{\partial x} \cdot dx + \frac{\partial F}{\partial y} \cdot dy$$

$$\text{if } dF = 0 \text{ then } \frac{dy}{dx} = \frac{-\frac{\partial F}{\partial x}}{\frac{\partial F}{\partial y}}$$