

Let  $w$  be a function of variables  $x$  and  $y$ . Then

$$w_x \stackrel{\text{def}}{=} \frac{\partial w}{\partial x}, \quad w_y \stackrel{\text{def}}{=} \frac{\partial w}{\partial y},$$

$$w_{xy} \stackrel{\text{def}}{=} \frac{\partial}{\partial y}(w_x), \quad w_{yx} \stackrel{\text{def}}{=} \frac{\partial}{\partial x}\left(\frac{\partial w}{\partial y}\right) = \frac{\partial}{\partial x}(w_y).$$

For example, if  $w = x(y^2)$ . Then

$$w_x = y^2, \quad w_{xy} = \frac{\partial}{\partial y}(w_x) = \frac{\partial}{\partial y}(y^2) = 2y,$$

$$w_{yx} = \frac{\partial}{\partial x}(w_y) = \frac{\partial}{\partial x}(2xy) = 2y.$$