

Basic Partial Derivatives

$$f(x, y) = 3x^3y^4$$

Coefficient: 3

X term: x^3

Y term: y^4

Taking the derivative with respect to x: Only focus on the derivative of the x term x^3 while leaving the y term y^4 unchanged.

$$f_x(x, y) = 3(x')y^4 = 3(3x^2)y^4 = 9x^2y^4$$

Taking the derivative with respect to y: Only focus on the derivative of the y term y^4 while leaving the x term x^3 unchanged.

$$f_y(x, y) = 3x^3(y') = 3x^3(4y^3) = 12x^3y^3$$

Take careful note of these next problems. I will highlight fine details that need attention. Specifically the superscripts and subscripts.

$f_{xx}(x, y)$ = the derivative of $f_x(x, y)$ with respect to x

$$f_{xx}(x, y) = 9(2x)y^4 = 18xy^4$$

$f_{xy}(x, y)$ = the derivative of $f_x(x, y)$ with respect to y

$$f_{xy}(x, y) = 9x^2(4y^3) = 36x^2y^3$$

$f_{yx}(x, y)$ = the derivative of $f_y(x, y)$ with respect to x

$$f_{yx}(x, y) = 12(3x^2)y^3 = 36x^2y^3$$

$f_{yy}(x, y)$ = the derivative of $f_y(x, y)$ with respect to y

$$f_{yy}(x, y) = 12x^3(3y^2) = 36x^3y^2$$