

Answer on Question#49891 - <Math> - <Multivariable Calculus>

For  $f(x, y) = x^2y^3 + x^4y$  find  $\frac{\partial^2 f}{\partial x^2}$ ;  $\frac{\partial^2 f}{\partial y^2}$ ;  $\frac{\partial^2 f}{\partial x \partial y}$ ;  $\frac{\partial^2 f}{\partial y \partial x}$

**Solution.** Let's find first-order derivatives:

$$\frac{\partial f}{\partial x} = 2xy^3 + 4x^3y; \quad \frac{\partial f}{\partial y} = 3x^2y^2 + x^4.$$

Thus, second-order derivatives would be:

$$\frac{\partial^2 f}{\partial x^2} = 2y^3 + 12x^2y;$$

$$\frac{\partial^2 f}{\partial y^2} = 6x^2y;$$

$$\frac{\partial^2 f}{\partial x \partial y} = 6xy^2 + 4x^3;$$

$$\frac{\partial^2 f}{\partial y \partial x} = 6xy^2 + 4x^3.$$