

## Answer on Question #49496 – Math – Differential Calculus | Equations

Task:

If  $w = \{xy / (x^2 + y^2)\}$  show that  $x \frac{\partial w}{\partial x} + y \frac{\partial w}{\partial y} = 0$

Solution:

$$\frac{\partial w}{\partial x} = \frac{y(x^2 + y^2) - 2x^2 y}{(x^2 + y^2)^2}$$

$$\frac{\partial w}{\partial y} = \frac{x(x^2 + y^2) - 2y^2 x}{(x^2 + y^2)^2}$$

$$\begin{aligned} x \frac{\partial w}{\partial x} + y \frac{\partial w}{\partial y} &= \frac{xy(x^2 + y^2) - 2x^3 y}{(x^2 + y^2)^2} + \frac{yx(x^2 + y^2) - 2y^3 x}{(x^2 + y^2)^2} = \frac{2yx(x^2 + y^2) - 2x^3 y - 2y^3 x}{(x^2 + y^2)^2} = \\ &= 2xy \frac{(x^2 + y^2) - x^2 - y^2}{(x^2 + y^2)^2} = 0 \end{aligned}$$