

Answer on Question #68293 – Math – Calculus

Question

Obtain the partial differential equation by eliminating the arbitrary constant from the relation

$$u = \frac{x^2}{2a^2} + \frac{y^2}{2b^2}$$

Solution

$$p = \frac{\partial u}{\partial x} = \frac{x}{a^2} \rightarrow a^2 = \frac{x}{p},$$

$$q = \frac{\partial u}{\partial y} = \frac{y}{b^2} \rightarrow b^2 = \frac{y}{q},$$

$$u = \frac{x^2}{2a^2} + \frac{y^2}{2b^2} = \left[a^2 = \frac{x}{p}, b^2 = \frac{y}{q} \right] = \frac{x^2}{2x} p + \frac{y^2}{2y} q = \frac{px}{2} + \frac{qy}{2},$$

$$2u = px + qy,$$

$$2u = x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}.$$

Answer: $2u = x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}.$