QUESTION

Determine whether the equation $(2xt^2 + x^2)\dfrac{dx}{dt} + 2x^2t + 1 = 0$ is exact. (Do NOT solve the equation).

ANSWER

$$\underbrace{(2xt^2 + x^2)}_{p}\dfrac{dx}{dt} + \underbrace{2x^2t + 1}_{q} = 0$$

$$\dfrac{\partial p}{\partial t} = 4xt, \quad \dfrac{\partial q}{\partial x} = 4xt.$$

These are the same so the equation is exact.