Answer on Question #70253, Math / Differential Equations

Verify that the indicated expression is an implicit solution of the given first order differential equation. Find at least one explicit solution  $y = \Phi(x)$  in each case. Use a graphing utility to obtain the graph of an explicit solution.

Give an interval I of definition of each solution  $\Phi$ .

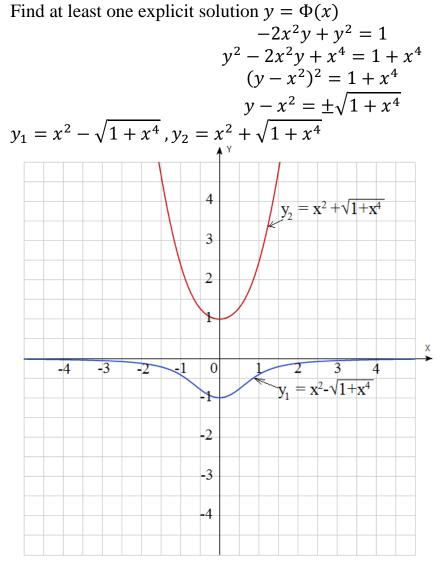
$$2xydx + (x^2 - y)dy = 0, \quad -2x^2y + y^2 = 1$$

Solution

Implicit differentiation with respect to x

$$\frac{d}{dx}[-2x^2y + y^2 = 1] => -4xy - 2x^2\frac{dy}{dx} + 2y\frac{dy}{dx} = 0$$
  
$$2xy + x^2\frac{dy}{dx} - y\frac{dy}{dx} = 0 => 2xy + (x^2 - y)\frac{dy}{dx} = 0$$
  
$$2xydx + (x^2 - y)dy = 0$$

Hence, the indicated expression  $-2x^2y + y^2 = 1$  is an implicit solution of the given first order differential equation  $2xydx + (x^2 - y)dy = 0$ .



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