Implicit Differentiation

Solutions should show all of your work, not just a single final answer.

1. Find $\dfrac{dy}{dx} = y'$ using implicit differentiation. Your final answer may involve both x and y.

   (a) $x^2y - xy^2 = x + y$

   (b) $\sin y = (2x + 1)$

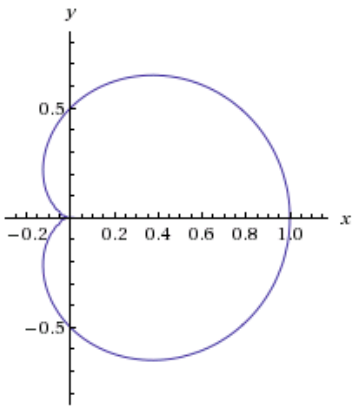
   (c) $\sin(x + y) = x + \cos(3y)$

   (d) $e^{xy} = x^2 + y^2$

   (e) $y = \tan^{-1}(x^2)$

2. Use implicit differentiation to find an equation of the tangent line to the curve $x^2 + y^2 = (2x^2 + 2y^2 - x)^2$ at the point $(0, \frac{1}{2})$.

   Note: the graph of this equation is known as a cardioid, shown below. It's certainly not the graph of a function, and this is where implicit differentiation can be helpful to us.



3. Given $9x^2 + y^2 = 9$, find $\dfrac{d^2y}{dx^2} = y''$ using implicit differentiation.