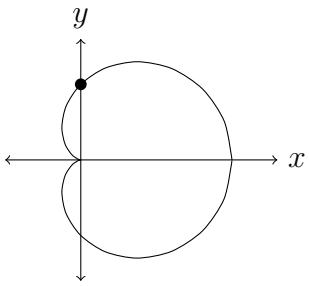
Implicit Differentiation

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

1. Find $\dfrac{dy}{dx}$ using implicit differentiation. Your final answer may involve both x and y.
   (a) $x^2y - axy^2 = x + y$ where a is a constant.
   (b) $\sin(x + y) = x + \cos(3y)$
   (c) $e^{xy} = x^2 + y^2$
   (d) $x = \arctan(y^2)$

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 $(0, 1/2)$. **Note**. The graph of this equation is known as a cardioid, shown below. It's not the graph of a function, and this is where implicit differentiation can be helpful to us.



3. On the ellipse $x^2 + 9y^2 = 9$, find $\dfrac{d^2y}{dx^2}$ using implicit differentiation. Your final answer may involve both x and y.