1. Find $d y / d x$ by implicit differentiation.

$$
y \cos x=x^{2}+y^{2}
$$

2. Consider the equation

$$
\begin{equation*}
\sqrt{x}+\sqrt{y}=1 \tag{*}
\end{equation*}
$$

(a) Find $y^{\prime}$ by implicit differentiation.
(b) Solve $(*)$ explicitly for $y$ and differentiate to get $y^{\prime}$ in terms of $x$.
(c) Check that your solutions in (a) and (b) are consistent.
3. (A §3.4 question.) For what values of $r$ does the function $y=e^{r t}$ satisfy the differential equation $y^{\prime \prime}-4 y^{\prime}+y=0$ ?
4. For the "cardiod" shown, with the equation and point given, find an equation of the tangent line.

$$
x^{2}+y^{2}=\left(2 x^{2}+2 y^{2}-x\right)^{2}, \quad\left(0, \frac{1}{2}\right)
$$


5. If $x y+e^{y}=e$, find the value of $y^{\prime \prime}$ at the point where $x=0$.

