The Implicit Function Theorem and the Inverse Function Theorem- HW Problems

1. Suppose z is implicitly defined by $e^z = xyz$. Find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ using the implicit function theorem.

2. Suppose z is implicitly defined by $x^3z^2 - xyz^3 = 0$. Using the implicit function theorem find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ at the point $(1,1,1)$.

3. Let $f: \mathbb{R}^2 \to \mathbb{R}^2$, by $f(x,y) = (x^2e^y, xy)$.
   a. Find $Df(2,0)$.
   b. Using the Inverse Function theorem find $Df^{-1}(f(2,0))$.