1. Find the differential $dz$ of $z = f(x,y) = x^3 + y^3 + xy$

**Solution:** Using the formula from the book, we first obtain partial derivatives of $f(x,y)$. The partial with respect to $x$ is $3x^2 + y$ and the partial with respect to $y$ is $3y^2 + x$. We simply use the formula from the book on page 944 and write $dz = (3x^2 + y)dx + (3y^2 + x)dy$. 