1. Find the curl and divergence of the vector field \( \mathbf{F} = \left( x y^2, 3 y^2 z^2, 2 x - z y^3 \right) \)

2. Determine whether the given vector field \( \mathbf{F} = \left( y^2, x^2 e^z, \cos xy \right) \) is conservative and/or incompressible.
3. If \( \mathbf{r} = \langle x, y, z \rangle \) and \( \|\mathbf{r}\| = r \), prove that \( \nabla \cdot (r \mathbf{r}) = 4r \).

4. Compute the Laplacian for \( f(x, y, z) = \frac{1}{x^2 + y^2 + z^2} \).