Question 1. (10 points) What is $\frac{du}{dt}$ if $u = x^4 - y^4$ and $x = \cos(t)$ and $y = \sin(t)$?

Question 2. (10 points) Suppose that the temperature in space is given by

$$T(x, y, z) = \frac{1}{x^2 + y^2 + z^2}$$

and let $p(t) = (3t^2 - t, t^2, t^3)$ be a parametrization for a path. What is the rate of change in temperature along the path when $t = 1$?
Question 3. (10 points) What is the equation for the tangent plane to \( f(g(x, y)) \) at \((3, 2)\) when \(g(x, y) = (x^2y^3, 3x - y^2)\) and \(f(s, t) = (-t, s)\)?