Instructions: Show all work. Use exact answers unless otherwise asked to round.

1. Consider the function $x = \sqrt{y^2 + z^2}$. Identify the surface. Convert the surface to parametric surface form $\vec{r}(u, v)$. Find the equation of the tangent plane at (5,3,4).

2. Find the arc length of the function $\vec{r}(t) = t^2 \hat{\imath} + \ln t \, \hat{\jmath} + t \ln t \, \hat{k}$ on the interval [1,e]. After setting up the integral, you may evaluate it numerically (in a calculator).

3. Find the curvature of the function $\vec{r}(t) = t^2\hat{\imath} + \ln t\,\hat{\jmath} + t\ln t\,\hat{k}$ at the point $(e^2,1,e)$. Then use that to find the radius of curvature.