1. Find a set of parametric equations for the curve of intersection of the cylinders $x = y^2$ and $y^2 + z^2 = 1$.

**Theorem.** For any vector $v$, $v \cdot v = |v|^2$.

**Theorem.** If $u(t)$ and $v(t)$ are differentiable vector functions, then $\frac{d}{dt} [u(t) \cdot v(t)] = u'(t) \cdot v(t) + u(t) \cdot v'(t)$.

2. If $r(t)$ is a space curve in a sphere of radius $c$ centered at the origin, then $|r(t)| = c$ for every $t$. Show that for such a curve $r(t)$ and $r'(t)$ are always orthogonal.
3. This problem deals with the space curves determined by the following sets of parametric equations:

\[ \begin{align*}
  x &= \cos t & y &= \sin t & z &= \cos 2t \\
  x &= 1 + s & y &= s^2 & z &= 1 + s
\end{align*} \]

a) Verify that the curves intersect at the point (1, 0, 1).

b) Find equations for the tangent line to each curve at (1, 0, 1).

c) Find an equation for the plane containing the two tangent lines you found in part b.