1. Find the angle between the curves at the indicated point.

\[ r_1(t) = (\cos t)i + (\sin t)i + tk, \]

at \((1, 0, 0)\).

\[ r_2(t) = (1 + t)i + t^2j + te^t k, \]

2. Solve the initial value problem

\[ r(0) = 0, \quad \frac{dr}{dt}(0) = i + j + k, \quad \frac{d^2r}{dt^2} = t^2i + tj + k \]

3. Find the arc length

\[ r(t) = t^2i + 2tj + (\ln t)k, \quad 1 \leq t \leq e^2. \]

4. Convert to Cartesian equation

\[ r = 4 \tan \theta \sec \theta \]

5. Find the area of the region shared by the circles \( r = 2 \sin \theta \) and \( r = 2 \cos \theta \).
6. Find the center and radius of the sphere

\[ x^2 + y^2 + z^2 + 6x - 8y + 4z + 4 = 0. \]

7. Find the equation for the plane through \((1, 1, -1), (2, 0, 2)\) and \((0, -2, 1)\).

8. Describe the surfaces.
   - (a) \( x^2 + 4y^2 + 9z^2 = 1 \)
   - (b) \( y^2 = -4x \)
   - (c) \( y^2 + x^2 = z^2 \)
   - (d) \( x^2 + y^2 - z^2 = -1 \)
   - (e) \( x = yz \)

9. Find the equation of tangent line at time \( t = \sqrt{3} \).

\[ \mathbf{r}(t) = (\ln(t^2 + 1))\mathbf{i} + (\tan\(^{-1}\) t)\mathbf{j} + (\sqrt{t^2 + 1})\mathbf{k} \]

10. Let \( C \) be the intersection of \( x^2 + y^2 = 16 \) and \( x + y + z = 5 \). Find the curvature at \((0, 4, 1)\).