1. Consider the line which passes through \( P(2, 1, -3) \) and \( Q(3, 0, -5) \).

(a) Write a symmetric equation for this line.

(b) Find where this line intersects the \( yz \)-plane.

(c) Find the distance from the point of intersection with the \( yz \)-plane and the point \( P \).

(d) Find the angle between the line and the \( x \)-axis.
2. Consider the lines

\[ L_1 : x = 1 - t; \quad y = -2 + 2t; \quad z = 4t \]

and

\[ L_2 : \quad \vec{r} = <2, -2, c> + s <1, 1, 2> \]

(a) Find the value of \( c \) so that these lines intersect.

(b) Find the equation of the plane which contains both lines.

3. A ball is thrown from 4 ft above the ground at an angle of 60°, and initial speed 40 ft/s. There is a wall 30 ft away on flat ground, of height 20 ft. Assume that \( g = 32 \) ft/s.

Will the ball go over the wall?
4. The position of a particle at time $t$ is given by
\[ \mathbf{r}(t) = \langle \ln(1 + e^t), \sin^{-1}(t/2), t \sec t \rangle. \]
Find the equation of the tangent line when $t = 0$.

5. The velocity of a particle at time $t$ is given by \[ \mathbf{v}(t) = \left\langle \frac{1}{t^2 + 4}, t \cos(t), \frac{1}{(t + 1)(t + 2)} \right\rangle, \]
and the initial position is \( \mathbf{r}(0) = 2\mathbf{j} - 3\mathbf{k}. \)
Find the position function \( \mathbf{r}(t) \).
6. At time $t = 0$ seconds, the position, velocity and acceleration of a particle are given by

$$\mathbf{r}(0) = <-2, 7, 9 >, \mathbf{v}(0) = <-2, 2, -1 >$$

and

$$\mathbf{a}(0) = <2, 3, 4 >.$$ Given that distances are in meters, find:

(a) The speed, $v(0)$

(b) The unit tangent vector, $\mathbf{T}(0)$

(c) The tangential component of acceleration, $a_T(0)$

(d) The normal component of acceleration, $a_N(0)$

(e) The curvature, $\kappa$

(f) The unit normal vector, $\mathbf{N}(0)$