1 Plane

A plane can be uniquely represented by its normal vector $\vec{n}$ and a point on the plane P_0.

To describe the plane using an equation, we can consider an arbitrary point $P = (x, y, z)$ on the plane. There is always a 90 degrees angle between the normal vector and the vector from P_0 to P (i.e., their dot product is zero)

$$\vec{n} \cdot \overrightarrow{P_0P} = 0$$

By plugging in the values for $\vec{n}$ and P_0 we get an equation in the form

$$Ax + By + Cz + D = 0$$

2 Vector-Valued Function

A vector-valued function is a function of a real parameter which returns a vector

$$r(t) = \begin{pmatrix} f(t) \\ g(t) \\ h(t) \end{pmatrix}$$

3 Tangent Vector Vector-Valued Function

Given a vector-valued function

$$r(t) = \begin{pmatrix} f(t) \\ g(t) \\ h(t) \end{pmatrix}$$

where f, g and h are differentiable, then the Tangent vector to the curve is given b

$$r'(t) = \begin{pmatrix} f'(t) \\ g'(t) \\ h'(t) \end{pmatrix}$$

4 Curve length

The length of the curve beteen a and b is the integral from a to b of $\sqrt{f'(t)^2 + g'(t)^2 + h'(t)^2}$.