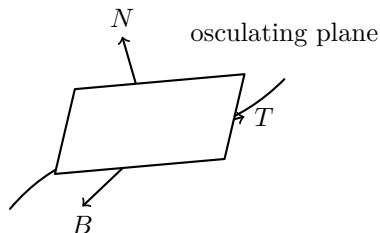


Question 6

For $\vec{r}(t) = \langle \cos t, \sin t, t \rangle$ at $t = 0$, find equations of the normal, osculating, and rectifying planes. State which Frenet vectors span each plane.

Question 6 – Solution

Strategy Use the frame from the helix and choose the Frenet vector perpendicular to each named plane.



Frame and point At $t = 0$, $P = (1, 0, 0)$, $\mathbf{T} \parallel \langle 0, 1, 1 \rangle$, $\mathbf{N} = \langle -1, 0, 0 \rangle$, and $\mathbf{B} \parallel \langle 0, -1, 1 \rangle$.

Planes The normal plane is perpendicular to $\mathbf{T}$: $y + z = 0$, and is spanned by $\mathbf{N}, \mathbf{B}$. The osculating plane is perpendicular to $\mathbf{B}$: $-y + z = 0$, spanned by $\mathbf{T}, \mathbf{N}$. The rectifying plane is perpendicular to $\mathbf{N}$: $x = 1$, spanned by $\mathbf{T}, \mathbf{B}$.