

Chapter 13, Section 4

Curvature and Normal Vectors of a Curve

If \vec{T} is the unit vector of a smooth curve, the curvature function is

$$k = \left| \frac{d\vec{T}}{dx} \right|$$

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Where $\vec{T} = \frac{\mathbf{v}}{|\mathbf{v}|}$ is the unit tangent vector

At a point where $k \neq 0$ the principal unit normal vector for a smooth curve in the plane is $\vec{N} = \frac{1}{k} \frac{d\vec{T}}{ds}$

If $\mathbf{r}(t)$ is a smooth curve then:

$$r(t) = (\ln \sec t)i + tj \quad -\frac{\pi}{2} < t < \frac{\pi}{2}$$

Find T, N, and k

$$r(t) = (\cos t + t \sin t)i + (\sin t - t \cos t)j + 3k$$

Find T, N, and k