

Exercise sheet 26

Curves and Surfaces, MTH201

1. If $\mathbf{v}_1(t), \mathbf{v}_2(t), \mathbf{v}_3(t)$, denote some vector fields which are *not necessarily* $\mathbf{T}(t), \mathbf{N}(t), \mathbf{B}(t)$, but nevertheless satisfy the same equations:

$$\dot{\mathbf{v}}_1 = \kappa(t)\mathbf{v}_2(t)$$

$$\dot{\mathbf{v}}_2 = -\kappa(t)\mathbf{v}_1(t) + \tau(t)\mathbf{v}_3(t)$$

$$\dot{\mathbf{v}}_3 = -\tau(t)\mathbf{v}_2(t)$$

Show that $f(t) = \mathbf{v}_1(t) \cdot \mathbf{T}(t) + \mathbf{v}_2(t) \cdot \mathbf{N}(t) + \mathbf{v}_3(t) \cdot \mathbf{B}(t)$ is constant. This does not necessarily mean that the individual terms are constant.