

**Problem.** Since  $\mathbf{a} = a_{\mathbf{T}}\mathbf{T} + a_{\mathbf{N}}\mathbf{N}$ ,  $a_{\mathbf{N}}\mathbf{N} = \mathbf{a} - a_{\mathbf{T}}\mathbf{T}$ . In the class, we proved that  $a_{\mathbf{N}} = v^2K > 0$ , thus  $a_{\mathbf{N}}\mathbf{N}$  and  $\mathbf{N}$  are in the same direction. Based on these observations, continue to prove that

$$\mathbf{N} = \frac{\left(\mathbf{v} \cdot \mathbf{v}\right)\mathbf{a} - \left(\mathbf{v} \cdot \mathbf{a}\right)\mathbf{v}}{\left\|\left(\mathbf{v} \cdot \mathbf{v}\right)\mathbf{a} - \left(\mathbf{v} \cdot \mathbf{a}\right)\mathbf{v}\right\|}.$$

You can use any theorem that is in the textbook or proved in the class.