

$$7. \vec{r}(t) = 3\vec{i} + 4\cos t \vec{j} + 4\sin t \vec{k}, t = \pi$$

$$\vec{r}'(t) = -4\sin t \vec{j} + 4\cos t \vec{k}$$

$$\begin{aligned} \|\vec{r}'(t)\| &= \sqrt{(-4\sin t)^2 + (4\cos t)^2} \rightarrow \|\vec{r}'(\pi)\| = 4 \\ &= \sqrt{16\sin^2 t + 16\cos^2 t} \\ &= \sqrt{16(\sin^2 t + \cos^2 t)} \\ &= \sqrt{16(1)} \\ &= 4 \end{aligned}$$

$$\vec{T}(t) = \frac{\vec{r}'(t)}{\|\vec{r}'(t)\|} = \frac{-4\sin t \vec{j} + 4\cos t \vec{k}}{4} = -\sin t \vec{j} + \cos t \vec{k}$$

$$\vec{T}'(t) = -\cos t \vec{j} - \sin t \vec{k}$$

$$\begin{aligned} \vec{T}'(\pi) &= -\cos \pi \vec{j} - \sin \pi \vec{k} \\ &= -(-1) \vec{j} \\ &= \vec{j} \end{aligned}$$



$$\|\vec{T}'(\pi)\| = \sqrt{1^2} = 1$$

$$K = \frac{\|\vec{T}'(\pi)\|}{\|\vec{r}'(\pi)\|} = \left(\frac{1}{4}\right)$$