Consider

$\hookrightarrow \vec{r}(t) = \langle 0, t, t^2 \rangle \rightarrow \vec{r}\,'(t) = \langle 0, 1, 2t \rangle \rightarrow \vec{r}\,''(t) = \langle 0, 0, 2 \rangle$

$$\vec{T}(t) = \frac{\vec{r}\,'(t)}{\|\vec{r}\,'(t)\|} = \frac{\langle 0, 1, 2t \rangle}{\sqrt{0^2 + 1 + 4t^2}} = \left\langle 0, \frac{1}{\sqrt{1+4t^2}}, \frac{2t}{\sqrt{1+4t^2}} \right\rangle$$

$$\vec{T}\,'(t) = \left\langle 0, -\frac{4t}{(1+4t^2)^{3/2}}, \frac{2}{(1+4t^2)^{3/2}} \right\rangle = \frac{1}{(1+4t^2)^{3/2}} \langle 0, -4t, 2 \rangle$$

$$\boxed{\frac{\vec{T}\,'(t)}{\|\vec{r}\,'(t)\|} = \frac{\frac{1}{(1+4t^2)^{3/2}} \langle 0, -4t, 2 \rangle}{\sqrt{1+4t^2}} = \left(\frac{1}{1+4t^2}\right) \langle 0, -4t, 2 \rangle}$$

On the other hand,

$$\vec{r}\,'(t) \times \vec{r}\,''(t) = \langle 0, 1, 2t \rangle \times \langle 0, 0, 2 \rangle = \langle 2, 0, 0 \rangle$$

so

$$\frac{\vec{r}\,'(t) \times \vec{r}\,''(t)}{\|\vec{r}\,'(t)\|^3} = \frac{\langle 2, 0, 0 \rangle}{(1+4t^2)^{3/2}}$$

So we observe

$$\frac{\vec{T}\,'(t)}{\|\vec{r}\,'(t)\|} \neq \frac{\vec{r}\,'(t) \times \vec{r}\,''(t)}{\|\vec{r}\,'(t)\|^3}$$