

$$(5) (e) \quad T = \frac{\gamma'(t)}{\|\gamma'(t)\|} = \frac{1}{6} \cdot \begin{pmatrix} -2\sin(2t) \\ 2\cos(2t) \\ 4\sqrt{2} \end{pmatrix} = \begin{pmatrix} -1/3 \sin(2t) \\ 1/3 \cos(2t) \\ 2\sqrt{2}/3 \end{pmatrix}$$

$$N = \frac{T'}{\|T'\|}$$

$$T' = \begin{pmatrix} -2/3 \cos(2t) \\ -2/3 \sin(2t) \\ 0 \end{pmatrix}, \quad \|T'\| = \sqrt{\frac{4}{9} \cos^2(2t) + \frac{4}{9} \sin^2(2t) + 0}$$

$$= \sqrt{\frac{4}{9}}$$

$$= 2/3$$

$$N = \frac{1}{2/3} \cdot \begin{pmatrix} -2/3 \cos(2t) \\ -2/3 \sin(2t) \\ 0 \end{pmatrix} = \begin{pmatrix} -\cos(2t) \\ -\sin(2t) \\ 0 \end{pmatrix}$$

$$(f) \quad \kappa = \frac{1}{\|\gamma'(t)\|} \cdot \|T'\|$$

$$= \frac{1}{6} \cdot \frac{2}{3} = \frac{1}{9}$$

$$(g) \quad (0, 1, \pi\sqrt{2}) \rightsquigarrow t = \pi/4$$

$$\begin{pmatrix} 1 \\ 0 \\ 4\pi\sqrt{2} \end{pmatrix} = \begin{pmatrix} \cos(2t) \\ \sin(2t) \\ 4\sqrt{2}t \end{pmatrix} \rightsquigarrow t = \pi$$

$$\int_{\pi/4}^{\pi} \|\gamma'(t)\| dt = \int_{\pi/4}^{\pi} 6 dt = 6t \Big|_{\pi/4}^{\pi} = 6\pi - \frac{6\pi}{4} = \frac{9\pi}{2}$$