4.1

$c(t) = \begin{pmatrix} t \\ t^3 \end{pmatrix}$ $c'(t) = \begin{pmatrix} 1 \\ 3t^2 \end{pmatrix}$ $c''(t) = \begin{pmatrix} 0 \\ 6t \end{pmatrix}$

$c(1) = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ $c'(1) = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$ $c''(1) = \begin{pmatrix} 0 \\ 6 \end{pmatrix}$

$$\varkappa_2(1) = \frac{\begin{vmatrix} 1 & 0 \\ 3 & 6 \end{vmatrix}}{\left\| \begin{pmatrix} 1 \\ 3 \end{pmatrix} \right\|^3} = \frac{6}{10\sqrt{10}} = \frac{3}{5\sqrt{10}}$$

$\vec{t}(1) = \frac{1}{\sqrt{10}} \begin{pmatrix} 1 \\ 3 \end{pmatrix}$ $\vec{n}_*(1) = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \frac{1}{\sqrt{10}} \begin{pmatrix} 1 \\ 3 \end{pmatrix} = \frac{1}{\sqrt{10}} \begin{pmatrix} -3 \\ 1 \end{pmatrix}$

TEČNA: $\begin{pmatrix} 1 \\ 1 \end{pmatrix} + \left\langle \begin{pmatrix} 1 \\ 3 \end{pmatrix} \right\rangle$ NORMÁLA $\begin{pmatrix} 1 \\ 1 \end{pmatrix} + \left\langle \begin{pmatrix} -3 \\ 1 \end{pmatrix} \right\rangle$

$-3x + y + 2 = 0$ $x + 3y - 4 = 0$

$$R(1) = \frac{1}{\varkappa_2(1)} = \frac{5}{3}\sqrt{10}$$

$$S(1) = \begin{pmatrix} 1 \\ 1 \end{pmatrix} + R(1)\,\vec{n}_*(1) = \begin{pmatrix} 1 \\ 1 \end{pmatrix} + \frac{5}{3}\sqrt{10}\,\frac{1}{\sqrt{10}} \begin{pmatrix} -3 \\ 1 \end{pmatrix} = \begin{pmatrix} -4 \\ \frac{8}{3} \end{pmatrix}$$

$\tilde{c}(s) = (s^3, s^9)^T$ $t = 1 = s^3 \Rightarrow s = 1$

$\tilde{c}'(s) = \begin{pmatrix} 3s^2 \\ 9s^8 \end{pmatrix}$ $\tilde{c}''(s) = \begin{pmatrix} 6s \\ 72s^7 \end{pmatrix}$

$$\varkappa_2(1) = \frac{\begin{vmatrix} 3 & 6 \\ 9 & 72 \end{vmatrix}}{\left\| \begin{pmatrix} 3 \\ 9 \end{pmatrix} \right\|^3} = \frac{162}{3^3 \cdot 10 \cdot \sqrt{10}} = \frac{3}{5\sqrt{10}}$$