4.3

$$c(t) = (t^3 - 3t, 3t^2)$$

$$c'(t) = (3t^2 - 3, 6t)$$

$$c''(t) = (6t, 6)$$

$$\kappa_2(t) = \frac{\begin{vmatrix} 3t^2-3 & 6t \\ 6t & 6 \end{vmatrix}}{\left((3t^2-3)^2 + (6t)^2\right)^{\frac{3}{2}}} = \frac{-18(t^2+1)}{27(1+t^2)^3} = -\frac{2}{3(1+t^2)^2}$$

$$\kappa_2'(t) = +\frac{8t}{3(1+t^2)^2} \Rightarrow \text{extrém v } t=0$$

$$\kappa_2(0) = -\frac{2}{3} \qquad R(0) = -\frac{3}{2}$$

$$\vec{t}(0) = \frac{1}{3}(-3, 0) = (-1, 0) \qquad \vec{n}(0) = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} -1 \\ 0 \end{pmatrix} = \begin{pmatrix} 0 \\ -1 \end{pmatrix}$$

$$S(0) = \begin{pmatrix} 0 \\ 0 \end{pmatrix} + \left(-\frac{3}{2}\right)\begin{pmatrix} 0 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ \frac{3}{2} \end{pmatrix}$$