(7) $x = \sqrt{t^2+3}$ $y = \ln(t^2+3)$ $z = t$ $(2, \ln 4, 1)$ $t = 1$

$r(t) = \langle \sqrt{t^2+3}, \ln(t^2+3), t \rangle$

$r'(t) = \langle \frac{t}{\sqrt{t^2+3}}, \frac{2t}{t^2+3}, 1 \rangle$

$r'(1) = \langle \frac{1}{2}, \frac{1}{2}, 1 \rangle$

$r = r_0 + t\,r'(1) = \langle 2, \ln 4, 1 \rangle + t\langle \frac{1}{2}, \frac{1}{2}, 1 \rangle$

$r = \langle 2 + \frac{1}{2}t, \ln 4 + \frac{1}{2}t, 1 + t \rangle$

$\boxed{x = 2 + \frac{1}{2}t \quad y = \ln 4 + \frac{1}{2}t \quad z = 1 + t}$

(8) $r(t) = \langle t^2, \ln t, t \ln t \rangle$ $(1, 0, 0)$ $\ln(t) = 0$ $t = e^0 = 1$

$t = 1$

$r'(t) = \langle 2t, \frac{1}{t}, 1 + \ln t \rangle$ $r'(1) = \langle 2, 1, 1 \rangle$

$|r'(t)| = \sqrt{4t^2 + \frac{1}{t^2} + (1+\ln t)^2}$ $|r'(1)| = \sqrt{4+1+1} = \sqrt{6}$

$r''(t) = \langle 2, \frac{-1}{t^2}, \frac{1}{t} \rangle$ $r''(1) = \langle 2, -1, 1 \rangle$

$r'(1) \times r''(1) = \begin{vmatrix} i & j & k \\ 2 & 1 & 1 \\ 2 & -1 & 1 \end{vmatrix} = \begin{vmatrix} 1 & 1 \\ -1 & 1 \end{vmatrix} i - \begin{vmatrix} 2 & 1 \\ 2 & 1 \end{vmatrix} j + \begin{vmatrix} 2 & 1 \\ 2 & -1 \end{vmatrix} k = \langle 2, 0, -4 \rangle$

$|\langle 2, 0, -4 \rangle| = \sqrt{4+16} = \sqrt{20}$

$k(1) = \frac{\sqrt{20}}{(\sqrt{6})^3} = \frac{2\sqrt{5}}{6\sqrt{6}} = \boxed{\frac{\sqrt{5}}{3\sqrt{6}}} = k(1)$