Math 114 Quiz 3

Name: _____ Section: _____

Find the curvature and torsion of the curve $(tcos(t), tsin(t), t)$ at the time $t = 0$.

$v(t) = (cos(t) - tsin(t), sint(t) + tcos(t), 1)$
$a(t) = (-2sin(t) - tcos(t), 2cos(t) - tsin(t), 0)$
$a'(t) = (-3cos(t) + tsin(t), -3sin(t) - tcos(t), 0)$

$v(0) = (1, 0, 1)$
$a(0) = (0, 2, 0)$
$a'(0) = (-3, 0, 0)$

$$v(0) \times a(0) = \begin{vmatrix} i & j & k \\ 1 & 0 & 1 \\ 0 & 2 & 0 \end{vmatrix}$$

$v(0) \times a(0) = (-2, 0, 2)$
$|v(0) \times a(0)| = 2\sqrt{2}$
$|v(0)| = \sqrt{2}$

$\kappa(0) = \frac{2\sqrt{2}}{\sqrt{2}^3} = \frac{2}{2} = 1$

$$\tau(0) = \frac{\begin{vmatrix} 1 & 0 & 1 \\ 0 & 2 & 0 \\ -3 & 0 & 0 \end{vmatrix}}{(2\sqrt{2})^2}$$

$\tau(0) = \frac{1(0+0)-0+1(0-(-6))}{8} = \frac{6}{8} = \frac{3}{4}$