Name: _____   Section: _____

Find the curvature and torsion of the curve (t, t^2, t^3) at the time $t = 0$.

$v(t) = (1, 2t, 3t^2)$
$a(t) = (0, 2, 6t)$
$a'(t) = (0, 0, 6)$

$v(0) = (1, 0, 0)$
$a(0) = (0, 2, 0)$
$a'(0) = (0, 0, 6)$

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

$v(0) \times a(0) = (0, 0, 2)$
$|v(0) \times a(0)| = 2$
$|v(0)| = 1$

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

$$\tau(0) = \frac{\begin{vmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 6 \end{vmatrix}}{(2)^2}$$

$\tau(0) = \frac{12}{4} = 3$