

QUIZ 2

(Math 200-Section A)

1. Find the vectors \mathbf{T} , \mathbf{N} and \mathbf{B} for the curve $\mathbf{r}(t) = ti + \frac{1}{2}e^{2t}j$. (4 pts)

2. Find the curvature κ and the torsion τ , at the given value of t ($t = 0$), for the curve $\mathbf{r}(t) = (e^t \sin 2t)i + (e^t \cos 2t)j + 2e^t k$. (4 pts)

3. Given $\mathbf{r}(t) = (2+t)\mathbf{i} + (t+2t^2)\mathbf{j} + (1+t^2)\mathbf{k}$, write the acceleration \mathbf{a} in the form $\mathbf{a} = a_T \mathbf{T} + a_N \mathbf{N}$ at the given value of t ($t=0$), without finding the vectors \mathbf{T} and \mathbf{N} .
(4 pts)

4. Show that the curvature κ of the line $\mathbf{r}(t) = (x_0 + At)\mathbf{i} + (y_0 + Bt)\mathbf{j} + (z_0 + Ct)\mathbf{k}$ is zero. What is its torsion τ ?
(4 pts)

5. Show that the curvature κ of a smooth curve $\mathbf{r}(t) = f(t)\mathbf{i} + g(t)\mathbf{j}$ defined by the twice-differentiable functions $x = f(t)$ and $y = g(t)$ is given by the formula:

$$\kappa = \frac{|\ddot{x}\dot{y} - \dot{x}\ddot{y}|}{(\dot{x}^2 + \dot{y}^2)^{3/2}} \quad (4 \text{ pts})$$