

QUIZ 2

(Math 200-Section B)

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

2. Find the curvature κ and the torsion τ , at the given value of t ($t = 0$), for the curve $\mathbf{r}(t) = (\cos^3 t)\mathbf{i} + (\sin^3 t)\mathbf{j}$. (4 pts)

3. Given $\mathbf{r}(t) = \frac{t^2}{2}\mathbf{i} + (3-t)\mathbf{j} + 2t\mathbf{k}$, write the acceleration \mathbf{a} in the form $\mathbf{a} = a_T\mathbf{T} + a_N\mathbf{N}$ at the given value of t ($t=1$), 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:

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