

Quiz for lecture 4 Zixin Qu

Q1. $\because x = \cos t, y = \sin t, z = t^2 + 1 \quad (1, 0, 1)$

$$\therefore \begin{cases} \cos t = 1 \\ \sin t = 0 \\ t^2 + 1 = 1 \end{cases}$$

$$\therefore t^2 = 0 \quad t = 0$$

$$r(t) = (\cos t, \sin t, t^2 + 1)$$

direction vector: $r'(t) = (-\sin t, \cos t, 2t)$

$$r(t) + r'(t) * t$$

$$= (1, 0, 1) + (-\sin 0, \cos 0, 0)t$$

$$= (1, t, 1)$$

$$\therefore x = 1, y = t, z = 1$$

Q2. $r'(t) = t\mathbf{i} + 2t\mathbf{j} + (t+1)\mathbf{k} \quad r(0) = \mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$

$$r(t) = \int (t\mathbf{i} + 2t\mathbf{j} + (t+1)\mathbf{k}) dt$$

$$= \frac{1}{2}t^2 + 2t + \frac{1}{2}t^2 + t + C = \frac{1}{2}(t+1)^2 + C$$

$$r(0) = \frac{1}{2}\mathbf{k} + C$$

$$C = \mathbf{i} + 2\mathbf{j} + \frac{5}{2}\mathbf{k}$$

$$\therefore r(t) = \frac{1}{2}t^2\mathbf{i} + 2t\mathbf{j} + \frac{1}{2}(t+1)^2\mathbf{k} + \mathbf{i} + 2\mathbf{j} + \frac{5}{2}\mathbf{k}$$

$$= \left(\frac{1}{2}t^2 + 1\right)\mathbf{i} + (2t + 2)\mathbf{j} + \left(\frac{1}{2}(t+1)^2 + \frac{5}{2}\right)\mathbf{k}$$

