FICHA 3A

(1)

$$\vec{r} = \vec{u} + t\,\vec{v} \qquad \vec{u} = (a,b,c) \quad \vec{v} = (l,m,n)$$

a)
$$\vec{r} = (a,b,C) + t(l,m,n)$$
$$r_1 = a + t\,l$$
$$r_2 = b + t\,m$$
$$r_3 = c + t\,n$$

b)
$$\frac{d\vec{r}}{dt} = (l,m,n)$$

(2)

$$\vec{r} = \vec{u} + \vec{v}\cos t + \vec{w}\,\text{sen}\,t \qquad \vec{u} = (2,1,0)\ ;\ \vec{v} = (0,1,-1)\ ;\ \vec{w} = (0,1,1)$$

$$\vec{r} = (2,1,0) + (0,1,-1)\cos t + (0,1,1)\,\text{sen}\,t$$

$$\vec{r} = (2,\ 1 + \cos t + \text{sen}\,t,\ 0 - \cos t + \text{sen}\,t)$$

$$\vec{r}\,'(t) = (0,\ -\text{sen}\,t + \cos t,\ \text{sen}\,t + \cos t)$$
$$\vec{r}\,''(t) = (0,\ -\cos t - \text{sen}\,t,\ \cos t - \text{sen}\,t)$$

(3)

$$\vec{r}(t) = (\cos t,\ \text{sen}\,t,\ t) \quad ; \quad t = \pi/4$$

$$r(\pi/4) = (\cos \pi/4,\ \text{sen}\,\pi/4,\ \pi/4) = \left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}, \frac{\pi}{4}\right)$$

$$\vec{r}(t) = (-\text{sen}\,t,\ \cos t,\ 1) \qquad \vec{r}\,'(\pi/4) = \left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}, 1\right)$$

$$(x,y,z) = \left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}, \frac{\pi}{4}\right) + \lambda\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}, 1\right)$$

(PS)

(4) $\vec{r} = (2\cos t, 2\sin t, t)$

$$L = \int_{t_0}^{t_1} \|\vec{r}\,'(t)\|\,dt = \int_{t_0}^{t_1} \sqrt{5}\,dt = \sqrt{5}\,(t)\Big|_{t_0}^{t_1} = \sqrt{5}\,(t_{1_f} - t_0$$

$$\vec{r}\,'(t) = (-2\sin t, 2\cos t, 1)$$

$$\|\vec{r}\,'(t)\| = \sqrt{4\sin^2 t + 4\cos^2 t + 1} = \sqrt{5}$$

(5)

$\vec{r}(t) = ?$

$\vec{r}(1) = e\,\vec{e_3}$ (m)

$\vec{r}\,'(1) = 3\vec{e_1} + 4\vec{e_2} + e\,\vec{e_3}$ (m/s)

$\vec{a}(t) = t\,\vec{e_1} + t^2\,\vec{e_2} + e^t\,\vec{e_3}$ (m/s^2)

$$\vec{v}(t) = \vec{r}\,'(t) = \int \vec{a}(t)\,dt = \left(\int t\,dt, \int t^2\,dt, \int e^t\,dt\right)$$

$$\vec{v}(t) = \left(\frac{t^2}{2} + K_1, \frac{t^3}{3} + K_2, e^t + K_3\right)$$

$$\vec{v}(1) = \left(\frac{1}{2} + K_1, \frac{1}{3} + K_2, e + K_3\right) = (3, 4, e)$$

$$\frac{1}{2} + K_1 = 3 \Leftrightarrow K_1 = \frac{5}{2}$$

$$\frac{1}{3} + K_2 = 4 \Leftrightarrow K_2 = \frac{11}{3}$$

$$e + K_3 = e \Leftrightarrow K_3 = 0$$

$$\vec{v}(t) = \left(\frac{t^2}{2} + \frac{5}{2}, \frac{t^3}{3} + \frac{11}{3}, e^t\right) \text{ (m/s)}$$

$$\vec{r}(t) = \int \vec{v}(t)\,dt = \left(\int \frac{t^2}{2}+\frac{5}{2}\,dt,\ \int \frac{t^3}{3}+\frac{11}{3}\,dt,\ \int e^t\,dt\right)$$

$$\vec{r}(t) = \left(\frac{t^3}{6}+\frac{5}{2}t+C_1,\ \frac{t^4}{12}+\frac{11}{3}t+C_2,\ e^t+C_3\right)$$

$$\vec{r}(1) = \left(\frac{1}{6}+\frac{5}{2}+C_1,\ \frac{1}{12}+\frac{11}{3}+C_2,\ e+C_3\right) = (0, 0, e)$$

$$\begin{cases} C_1 = -\frac{1}{6}-\frac{5}{2} \\ C_2 = -\frac{1}{12}-\frac{11}{3} \\ C_3 = 0 \end{cases}$$

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