

16a

IV/1

$$\vec{r}(t) = (3 \cos t, 3 \sin t, 4t)$$

$$\dot{\vec{r}}(t) = (-3 \sin t, 3 \cos t, 4)$$

$$\ddot{\vec{r}}(t) = (-3 \cos t, -3 \sin t, 0)$$

$$\vec{r}(2\pi) = (3, 0, 8\pi) = \mathcal{R}$$

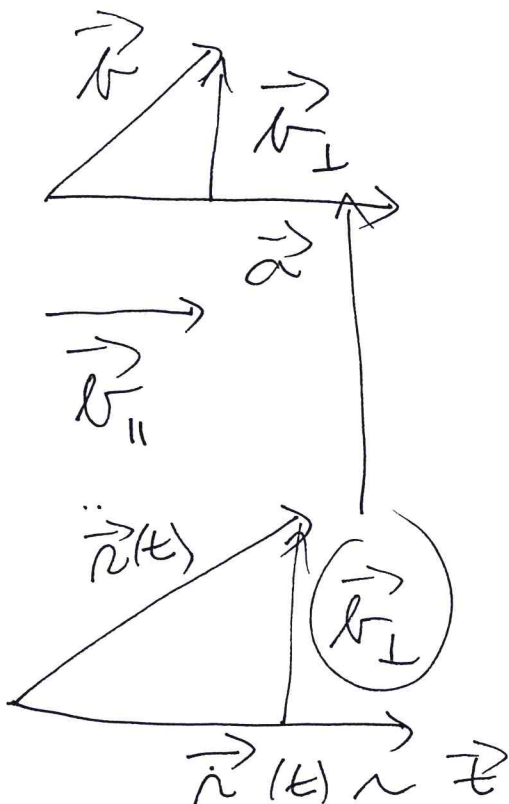
$$\dot{\vec{r}}(2\pi) = (0, 3, 4) \Rightarrow \vec{e} \sim \vec{e}$$

$$\ddot{\vec{r}}(2\pi) = (-3, 0, 0)$$

$$\|\dot{\vec{r}}(2\pi)\| = \sqrt{0 + 3^2 + 4^2} = 5$$

$$\vec{e} = \frac{\dot{\vec{r}}(2\pi)}{\|\dot{\vec{r}}(2\pi)\|} = \frac{1}{5} (0, 3, 4) =$$

$$= (0, 0.6, 0.8)$$



$$\vec{r}_{\parallel} = \frac{\vec{a} \cdot \vec{r}}{\vec{a} \cdot \vec{a}} \vec{a}$$

$$\vec{r}_{\perp} = \vec{r} - \vec{r}_{\parallel}$$

$$\vec{n} \cdot \vec{n} = 0$$

$$\vec{n} \cdot \vec{n} = 0^2 + 3^2 + 4^2 = 25$$

$$\vec{b}_{\parallel} = \frac{0}{25} \vec{a} = \vec{0}$$

$$\vec{b}_{\perp} = \vec{b}$$

$$\vec{e} = (0, 0.6, 0.8)$$

$$\vec{n} = (-1, 0, 0)$$

$$\vec{b} = \vec{e} \times \vec{n} = (0, -0.8, 0.6)$$

16 b

$$\vec{r}(t) = (-3 \sin t, 3 \cos t, -2e^{-2t})$$

$$\vec{r}'(t) = (-3 \cos t, -3 \sin t, 4e^{-2t})$$

$$\vec{r}'' = ?$$

$$\vec{r}(0) = (0, 3, -2)$$

$$\vec{r}'(0) = (-3, 0, 4)$$

$$\vec{r}(0) \cdot \vec{r}'(0) = 0 + 3^2 + (-2)^2 = 13$$

$$\vec{r}(0) \cdot \vec{r}''(0) = -8$$

$$\vec{b}_{||} = \frac{-8}{13} (0, 3, -2)$$

$$\vec{r} = \vec{b} - \vec{b}_{||} =$$

$$\vec{r}(0) -$$

$$\begin{pmatrix} -3 \\ 0 \\ 4 \end{pmatrix} - \begin{pmatrix} 0 \\ 3 \\ -2 \end{pmatrix} = \begin{pmatrix} 0 \\ -24 \\ 16 \end{pmatrix} =$$

$$\vec{r} = \begin{pmatrix} 0 \\ -24 \\ 16 \end{pmatrix}$$

$$\vec{r} = \begin{pmatrix} -3 \\ \frac{24}{13} \\ \frac{36}{13} \end{pmatrix}$$

52-16 ~~50+24~~
-50+16