Найти базисные векторы репера Френе винтовой линии $\alpha(t) = {}^{t}(\text{a}\cdot cos(t),\ \text{a}\cdot sin(t),\ \text{bt})$.

Вычисляем производные:

$\dot{\alpha}(t) = {}^{t}(\text{-a}\cdot sin(t),\ \text{a}\cdot cos(t),\ \text{b})$ $\qquad\qquad$ $\ddot{\alpha} = {}^{t}(\text{-a}\cdot cos(t),\ \text{-a}\cdot sin(t),\ 0)$

Векторное произведение:

$$\dot{\alpha}(t) \times \ddot{\alpha}(t) = \begin{vmatrix} -a \cdot sin(t) & -a \cdot cos(t) & e_1 \\ a \cdot cos(t) & -a \cdot sin(t) & e_2 \\ \text{b} & 0 & e_3 \end{vmatrix} = {}^{t}(\text{a}\cdot\text{b}\cdot sin(t),\ \text{-a}\cdot\text{b}\cdot cos(t),\ a^2)$$

$E_1 = \frac{\dot{\alpha}}{|\dot{\alpha}|} = \frac{1}{\sqrt{a^2+b^2}} \cdot {}^{t}(\text{-a}\cdot sin(t),\ \text{a}\cdot cos(t),\ \text{b})$

$E_3 = \frac{\dot{\alpha}\times\ddot{\alpha}}{|\dot{\alpha}\times\ddot{\alpha}|} = \frac{1}{\sqrt{a^2+b^2}} \cdot (\text{b}\cdot\sin(\text{t}),\ \text{-b}\cdot\cos(\text{t}),\ \text{a})$

$$E_2 = E_3 \times E_1 = \frac{1}{a^2+b^2} \cdot \begin{vmatrix} b \cdot sin(t) & -a \cdot sin(t) & e_1 \\ -b \cdot cos(t) & a \cdot cos(t) & e_2 \\ \text{a} & \text{b} & e_3 \end{vmatrix} =$$

$$= \frac{1}{a^2+b^2} \cdot {}^{t}\left(-(a^2+b^2)\cdot\cos(\text{t}),\ \text{-}(\text{a}^2+b^2)\cdot\sin(\text{t}),\ 0\right) = {}^{t}(\text{-}\cos(\text{t}),\ \text{-}\sin(\text{t}),\ 0)$$

Репер Френе: $(\alpha(t), E_1, E_2, E_3)$