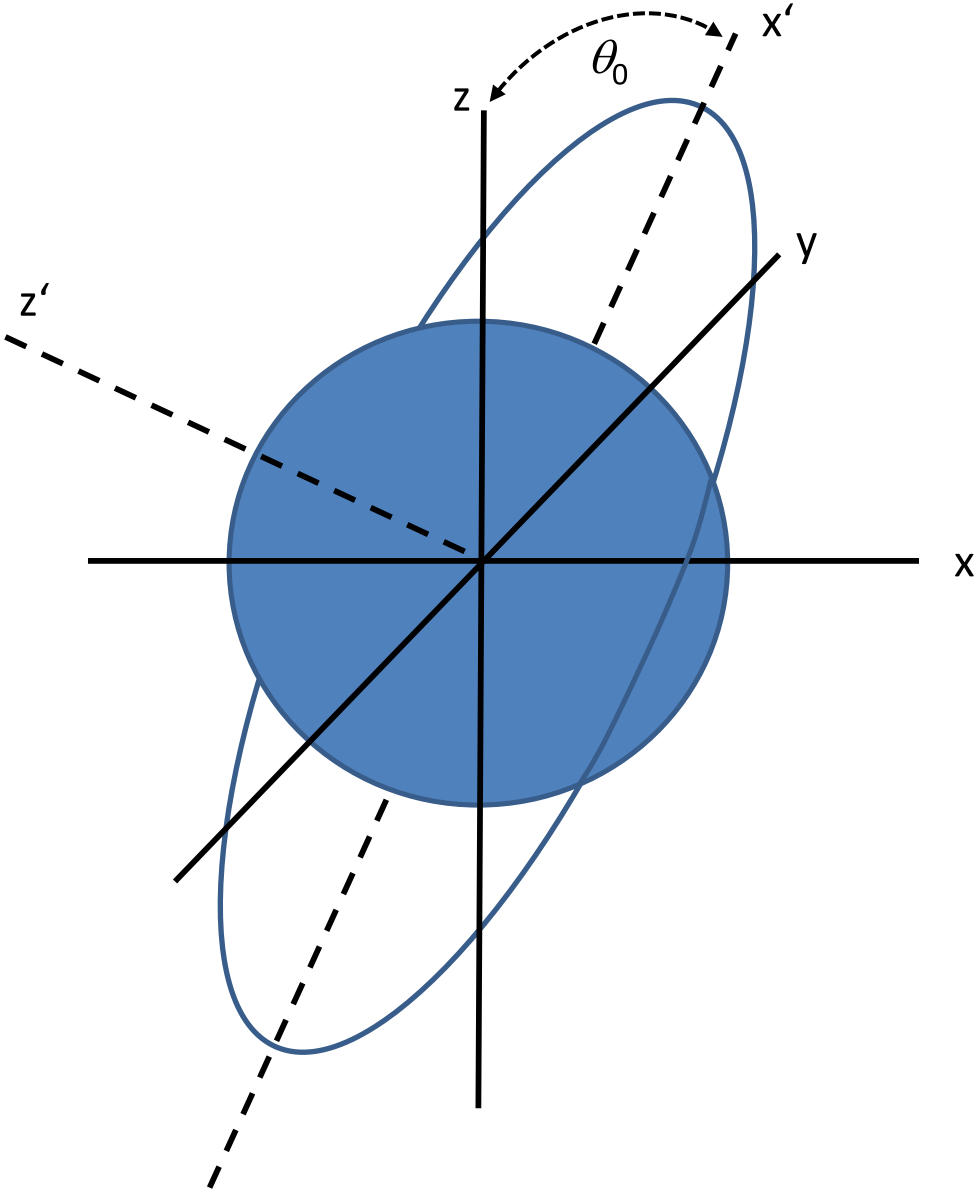
Enakomerno pospešeno kroženje



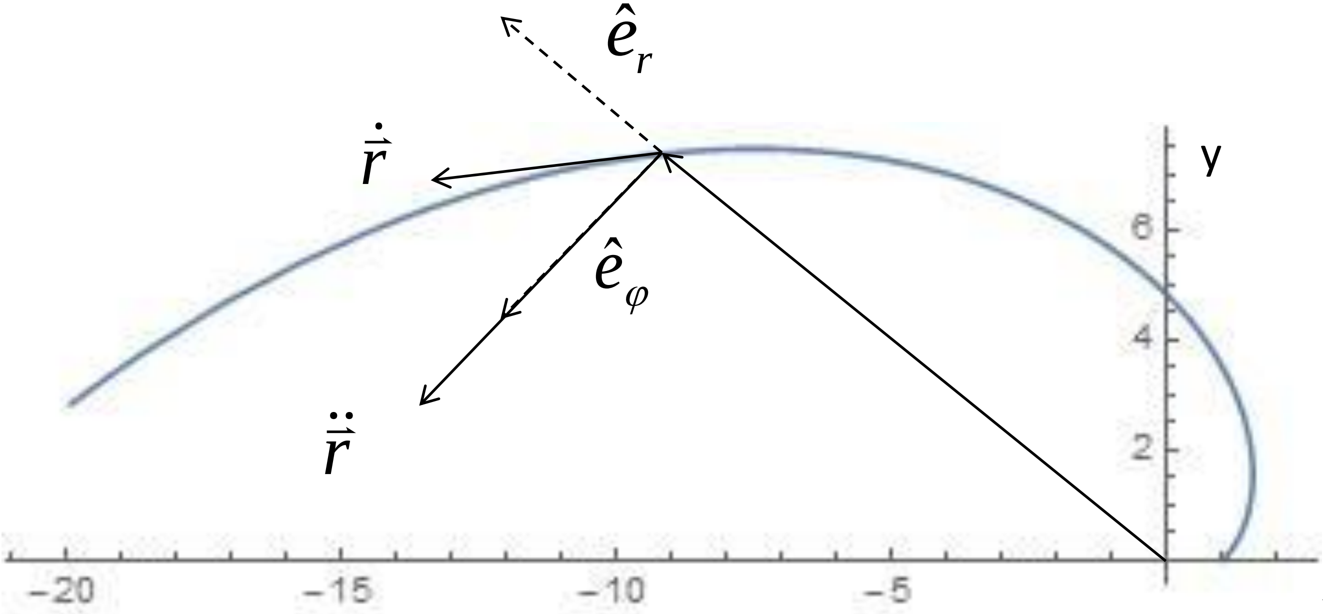
$$\ddot{\vec{r}} = -R(\omega_0 + \alpha t)^2 \hat{e}_r + R\alpha \hat{e}_\varphi$$

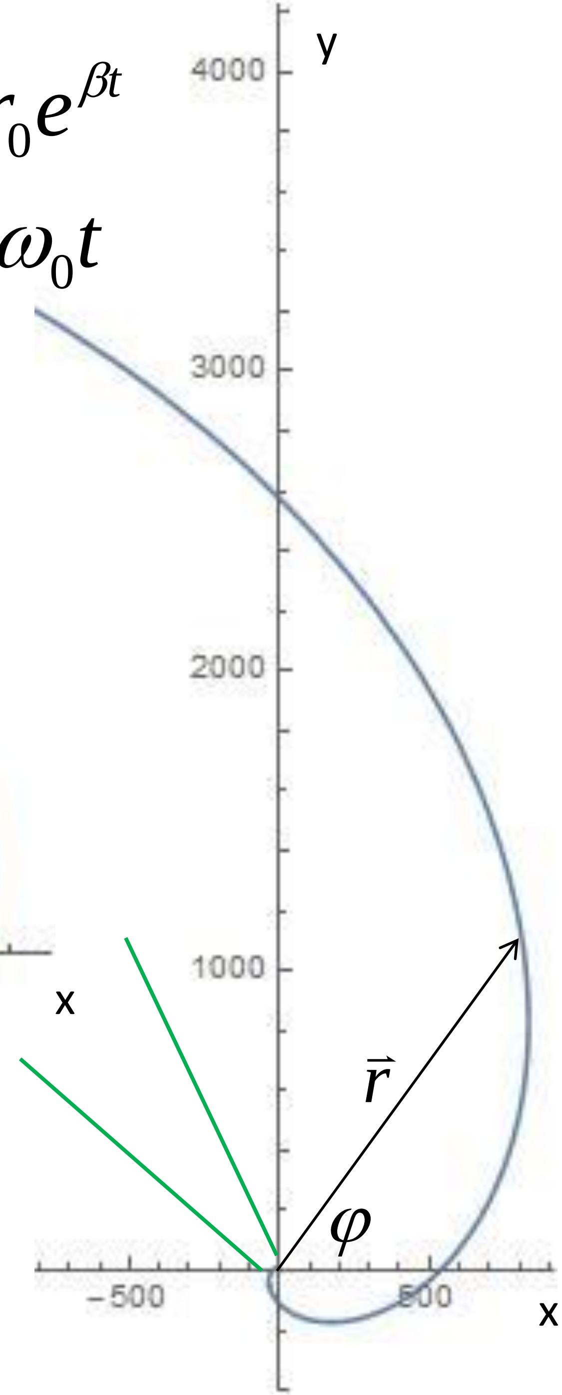
Gibanje po spirali

$$r = r_0 e^{\beta t}$$

$$\varphi = \omega_0 t$$

$$\dot{\vec{r}} = r_0 \beta e^{\beta t} \hat{e}_r + r_0 \omega_0 e^{\beta t} \hat{e}_\varphi$$





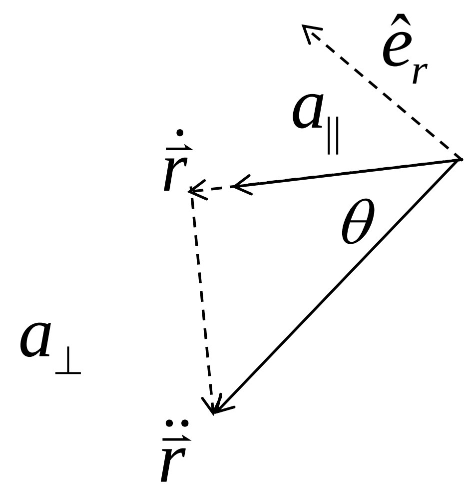
$$\ddot{\vec{r}} = r_0 e^{\beta t} (\beta^2 - \omega_0^2) \hat{e}_r + 2 r_0 \beta \omega_0 e^{\beta t} \hat{e}_\varphi$$

$$\ddot{\vec{r}} \underbrace{=}_{\beta^2 = \omega_0^2} 2 r_0 \omega_0^2 e^{\omega_0 t} \hat{e}_\varphi$$

$$\ddot{\vec{r}} \cdot \dot{\vec{r}} = \left|\ddot{\vec{r}}\right|\left|\dot{\vec{r}}\right| \cos\theta = 2 r_0^2 \omega_0^3 e^{2\omega_0 t}$$

$$\left|\dot{\vec{r}}\right| = \sqrt{2} r_0 \, \omega_0 e^{\omega_0 t}$$

$$\left|\ddot{\vec{r}}\right| = 2 r_0 \, \omega_0^2 e^{\omega_0 t}$$



$$\cos\theta = \frac{2 r_0^2 \omega_0^3 e^{2\omega_0 t}}{2\sqrt{2} r_0^2 \omega_0^3 e^{2\omega_0 t}} = \frac{1}{\sqrt{2}}$$

$$a_\perp = \left|\ddot{\vec{r}}\right| \sin\theta = \sqrt{2} r_0 \omega_0^2 e^{\omega_0 t}$$

$$a_\parallel = \left|\ddot{\vec{r}}\right| \cos\theta = \sqrt{2} r_0 \omega_0^2 e^{\omega_0 t}$$

$$\dot{\vec{r}} \underbrace{=}_{\beta^2 = \omega_0^2} r_0 \omega_0 e^{\omega_0 t} \hat{e}_r + r_0 \omega_0 e^{\omega_0 t} \hat{e}_\varphi$$

$$\ddot{\vec{r}} \underbrace{=}_{\beta^2 = \omega_0^2} 2 r_0 \omega_0^2 e^{\omega_0 t} \hat{e}_\varphi$$

$$\hat{e}_\varphi \perp \hat{e}_r \Rightarrow \hat{e}_\varphi \cdot \hat{e}_r = 0$$

$$\hat{e}_\varphi \cdot \hat{e}_\varphi = \left|\hat{e}_\varphi\right|^2 = 1$$