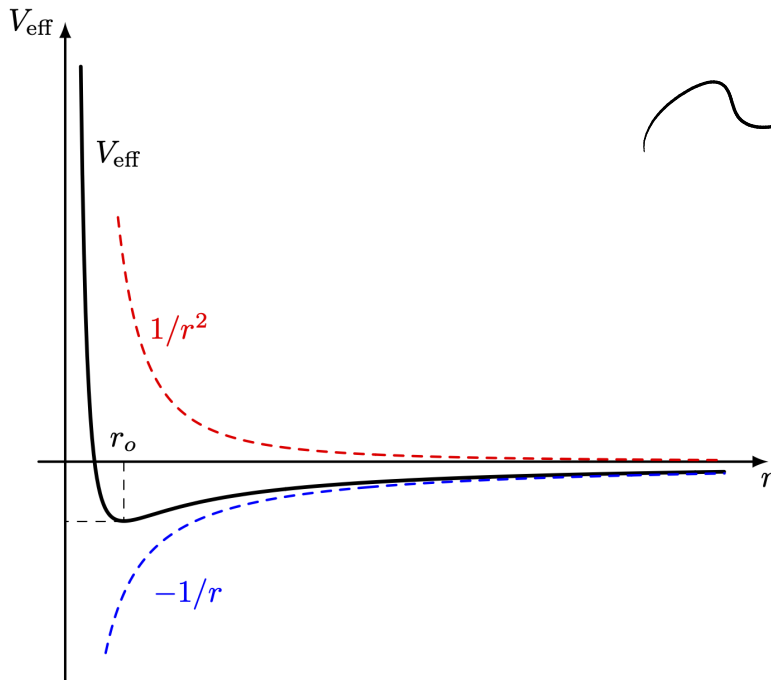


Aula 07

# Mecânica Celeste

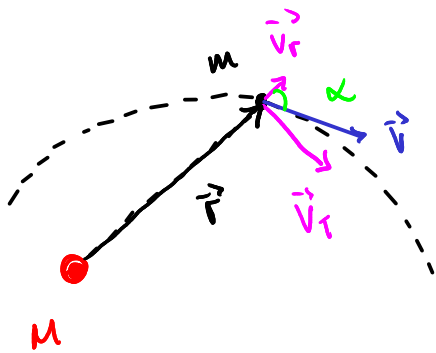
## Potencial Efetivo de uma Órbita



Gráfico

Potencial efetivo x distância

Como é definida a energia potencial efetiva?



$$E = \frac{1}{2} m v^2 - \frac{GMm}{r}$$

$$\vec{v} = \vec{v}_r + \vec{v}_t \quad \therefore v^2 = v_r^2 + v_t^2$$

$$\therefore E = \frac{1}{2} m v_r^2 + \frac{1}{2} m v_t^2 - \frac{GMm}{r}$$

Pela conservação do Momento Angular:

$$L = m v r \sin \alpha$$

$$v \sin \alpha = v_t \quad \therefore L = m v_t r$$

$$\therefore v_t = \frac{L}{mr}$$

$$E = \frac{1}{2} m V_r^2 + \frac{1}{2} m \left( \frac{L}{mr} \right)^2 - \frac{GMm}{r}$$

$$E = \underbrace{\frac{1}{2} m V_r^2}_{\text{Energia Cinética}} + \underbrace{\frac{1}{2} \frac{L^2}{mr^2} - \frac{GMm}{r}}_{\text{Energia Potencial Efetiva}}$$

## Análise do Gráfico

$$U_{\text{eff}} = \frac{1}{2} \frac{L^2}{mr^2} - \frac{GMm}{r}$$

