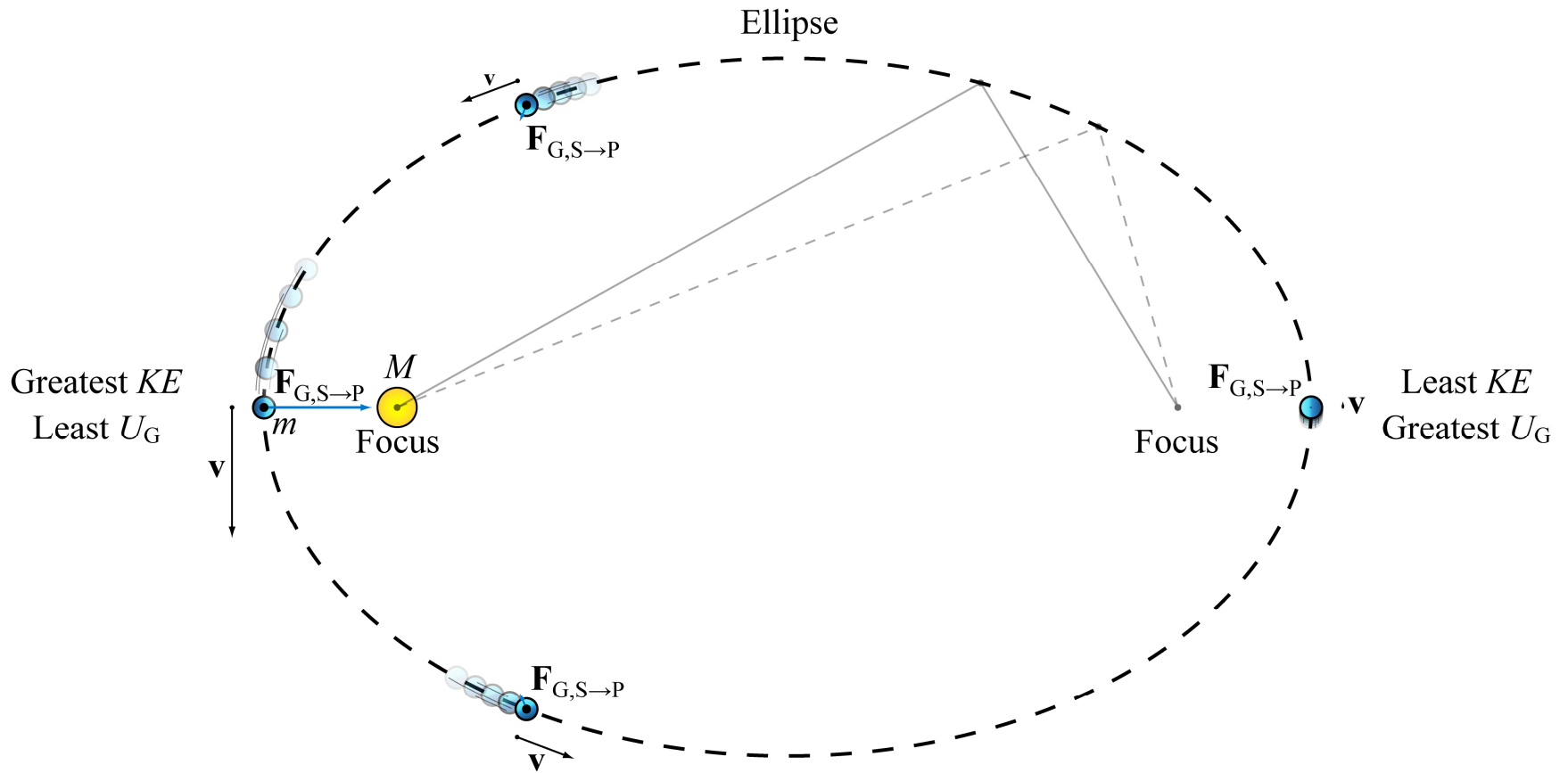


A mass gravitationally attracted to another anchored mass can trace out an ellipse



Force

magnitude $F_G = G \frac{Mm}{r^2}$

direction attractive

Universal constant $G = 6.67 \times 10^{-11} \text{ N} \cdot \frac{\text{m}^2}{\text{kg}^2}$

Mechanical energy

$$KE_i + U_{G,i} + U_{S,i} + \Delta W_{\text{EXT}} = KE_f + U_{G,f} + U_{S,f} + \Delta U_{\text{INT}}$$

$$\frac{1}{2}mv_i^2 - G\frac{Mm}{r_i} = \frac{1}{2}mv_f^2 - G\frac{Mm}{r_f}$$