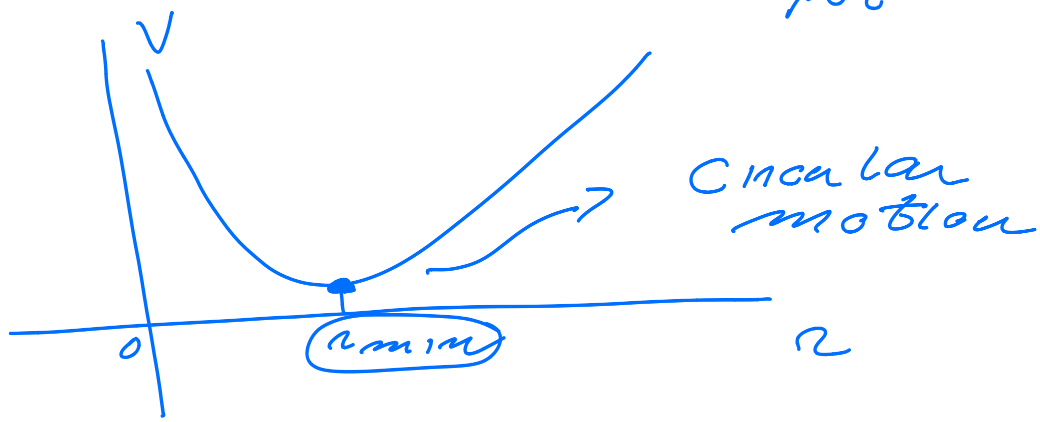
PHY 321 MARCH 31

Example 3

$$V(r) = \beta \cdot r \qquad \beta > 0$$

Find the angular frequency

$$V_{eff}(r) = V(r) + \frac{L^2}{2\mu r^2}$$



find the minimum

$$\frac{dV_{eff}}{dr} = 0 = \beta - \frac{L^2}{\mu r^3}$$

$$\beta = \frac{L^2}{\mu r_{min}^3}$$

$$r_{min} = \left[\frac{L^2}{\beta \mu}\right]^{1/3}$$

$$\frac{d\phi}{dt} = \dot{\phi} = \frac{L}{\mu r^2} \Rightarrow$$

μr_{min}

$$\dot{\phi} = \frac{\beta^{2/3}}{(\mu L)^{1/3}}$$

$$V_{eff}(r) = \beta r + \frac{L^2}{2\mu r^2}$$

$$F_r = -\frac{dV_{eff}}{dr} = -\beta + \frac{L^2}{\mu r^3}$$

$$\mu \frac{d^2 r}{dt^2} = F_r = -\beta + \frac{L^2}{\mu r^3}$$

$$\mu \frac{d^2 r}{dt^2} = -\beta + \frac{L^2}{\mu r^3}$$

award : 50 $.

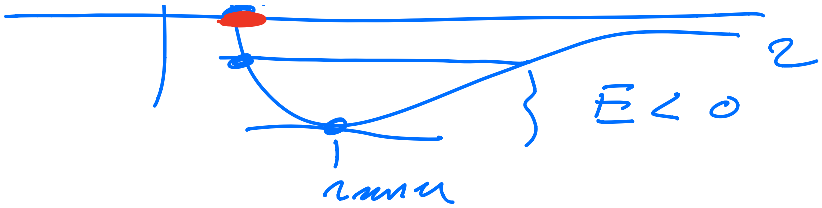
— $V(r) = \beta \cdot r$

$V(r) = -\alpha/r$ (hw 9)

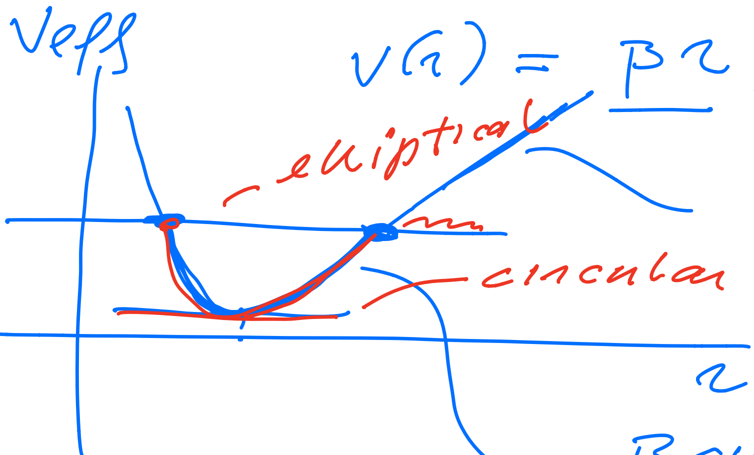
$$-\alpha/r + \frac{L^2}{2\mu r^2}$$

$E > 0$

$E = 0$ } unbounded



Bounded orbits



$V(r) = \underline{\beta r} \,/\, \frac{1}{2} k r^2$

$\beta \cdot r + \frac{L^2}{2\mu r^2}$

Bounded or unbounded orbits

$$V_{eff}(r) = V(r) + \frac{L^2}{2\mu r^2}$$

$$= -\alpha/r + \frac{L^2}{2\mu r^2}$$

$\dot{r} = 0$

$$E = 0 = -\alpha/r + \frac{L^2}{2\mu r^2} \Rightarrow$$

$$r = \frac{L^2}{2\mu\alpha}$$

$L = \underline{1}$

$\mu = \underline{1}$

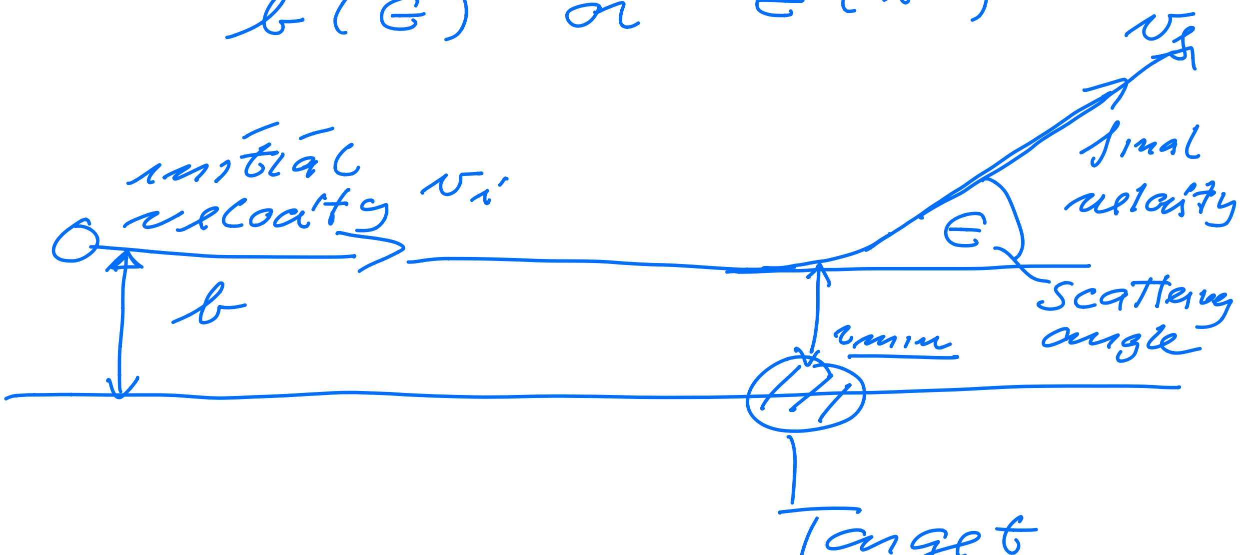
$\alpha = \underline{1}$

$$r = \frac{1}{2}$$

Two-body - scattering

- Rutherford scattering (classical scattering)
- scattering angle Θ ← expt
- impact parameter b

$b(\Theta)$ or $\Theta(b)$



$\Theta = 0$, no scattering

$\Theta = \pi$: head on