6.11) \[ f(1/u) = -ku^3 \]
therefore
\[ \frac{d^2 u}{d\theta^2} + (1 - \frac{k}{ml^2})u = 0 \]
solve for 3) cases \((1-k/ml^2) > 0, =0, \text{ and } < 0.\)

6.13) \[ r = a\theta \]
\[ \theta = bt \]

\[ f(\theta) = m(2\frac{dr}{dt}\frac{d\theta}{dt} + r\frac{d^2\theta}{dt^2}) \]
\[ f(\theta) = 0 \text{ (central force)} \]
if
\[ \theta = bt^n \]
for which value of \(n\) is the force central

6.19) \[ \frac{\Delta a}{a} = (?) \frac{\Delta v}{v} \]
find the relation between the relative change in speed and semi-major axis.
Use
\[ \Delta a = \left(\frac{\partial a}{\partial E}\right) \Delta E \]
\[ \Delta E = \Delta T + \Delta V = \Delta T \]
(no change in potential energy)
\[ \Delta T = \left(\frac{\partial T}{\partial v}\right) \Delta v \] also the energy in terms of “a” is \( E = \frac{-k}{2a} \)
6.20)

\[ E = T + V \]

so

\[ \langle E \rangle = \langle T \rangle + \langle V \rangle = E = \frac{-k}{2a} \]

\[ \langle T \rangle = -\frac{1}{2} \langle V \rangle \]

where the last expression (virial theorem) was derived in class.