Recall – midterm exam Friday

Coverage: Taylor, Chaps. 7-9, but no Coriolis force
Problems, not proofs
I’ll bring paper.

Closed book, closed notes, except
You can bring: one 8.5” X 11” sheet of notes

Explain what you’re doing, but
No need for complete sentences, Queen’s English
No swear words

Highlights so far – Taylor, Chap. 7

F = ma means “minimize the action”
Action = \[ \int L dt \] , \[ L = T - U \]
Lagrange equations of motion, for generalized coordinate \( x \)
\[ \frac{\partial L}{\partial x} - \frac{d}{dt} \left( \frac{\partial L}{\partial \dot{x}} \right) = 0 \]

Expect to work a problem with this
(Cartesian, spherical, or maybe cylindrical coordinates)
Lagrange naturally handles constraints
Conserved quantities

Highlights so far – Taylor, Chap 8

Center-of-mass, relative coordinates
Reduce 6 degrees of freedom to 3, 2, maybe 1
Conservation of angular momentum \[ \dot{\theta} = \frac{I}{\mu} \]
Effective potential (for gravity) \[ U_{ef} = \frac{r^2}{2\mu} \]
Orbit equation (focus on elliptical orbits, \( 0 < e < 1 \))
\[ r(\phi) = \frac{r}{1 + e \cos \phi} \]
Kepler’s laws
\[ t^2 \propto a^3 \]

Highlights so far – Taylor, Chap 9

Inertial forces – think accelerating train, \( F = -mA \)
Tides: forget about the tides
Relation between inertial and rotating frames
\[ \left( \frac{d\tilde{Q}}{dt} \right)_{ inert } - \left( \frac{d\tilde{Q}}{dt} \right)_{ rot } = \tilde{\Omega} \times \tilde{Q} \]
Centrifugal force
\[ m \left( \tilde{\Omega} \times \tilde{r} \right) \times \tilde{\Omega} \]