1. Write the equations of motion for a rectangular block constrained such that its y body axis lies on the line $z = ky$ supposing gravity to act in the negative $z$ direction. Denote the mass of the block by $m$ and the semiaxes by $a$, $b$ and $c$.

2. Find the direction and magnitude of the rotation for all three Euler angles equal to $\pi/4$.

3. Consider an axisymmetric rod with its symmetry axis in the vertical direction. The length of the rod exceeds its diameter. Suppose a force exceeding gravity to be applied to the lower end, on the symmetry axis and parallel to the body $z$ axis. Is motion in the $z$ direction stable? (You’ll need to think a little about the meaning of stable vs. unstable here. We looked at exponential instability in class; one can have algebraic instability as well.)

4. Suppose the force in problem 3 to be directed in the inertial $z$ direction. Can you find an equilibrium? Is it stable?