1. Goldstein - Chapter 2, Exercise #9

2. Goldstein - Chapter 2, Exercise #12

3. Goldstein - Chapter 2, Exercise #20

Use the method of Lagrange multipliers to find the equations of motion for the particle and wedge. Then obtain an expression for the forces of constraint. You do not need to complete the other portions of the problem.

4. A uniform density solid cylinder of mass m and radius r rolls without slipping on a fixed cylinder of radius R. The only external force is gravity. Use the method of Lagrange multipliers to determine at what point the rolling cylinder falls off the fixed cylinder.
6. A particle moves in a central force field given by the potential

\[ V = -k \frac{e^{-ar}}{r} \]

where \( k \) and \( a \) are positive constants.

a) Using the method of equivalent one-dimensional potential, describe the nature of the motion, stating the ranges of \( \ell \) and \( E \) appropriate to each type of motion.

b) When are circular orbits possible?

c) Find the period of small radial oscillations about the circular motion.