1. Taylor: Problem 1.22.

2. Two blocks of masses $2m$ and $m$ are connected by a weightless string over a frictionless, massless pulley, as shown in the figure. The coefficient of kinetic friction between the block and the incline is $\mu_k$. The system is in a uniform gravitational field directed downward of strength $g$. Find the incline angle $\theta$ such that the blocks move at a constant speed. Distinguish between the cases of upward and downward motion. Rationalize your solutions using a simple physical picture.

3. A projectile is fired with an initial speed $v_0$ at an elevation angle of $\alpha$ (measured from the horizontal) up a hill of a fixed slope $\beta$, with $\alpha > \beta$. Neglect air resistance.
   
   (a) How far up the hill will the projectile land for a given $\alpha$?
   
   (b) For what value of the angle $\alpha$ will the range be at the maximum?
   
   (c) Find the maximum range.

4. Taylor: Problem 1.27. The radius of turnatable is $R$ and the speed of the puck is $v$. Sketch the trajectory in the rotating frame for the cases (a) $2\omega R/v = \pi/3$; (b) $2\omega R/v = \pi/2$; (c) $2\omega R/v = \pi$.

6. A block of mass $m$ slides down a frictionless track shown in the figure. The track is of irregular shape except for the segment OAB which is circular with radius $R$. The arc AB forms the angle of $45^\circ$. The block is released from rest at $x = 0$ and at height $h$ above the bottom of the loop (point A). The block is in the gravitational field of Earth and there is no air resistance.

(a) What is the force of the track on the block at point A?

(b) What is the force of the track on the block at point B?

(c) At what speed does the block leave the track (the track ends at point B)?

(d) How far away from point A does the block land on level ground.

(e) Sketch the potential energy $U(x)$ of the block. Indicate the total energy of the block on the sketch.