

Sample Exam 2 – Physics 200 – Fall 2017.

- 1a. A car travels the bottom of a rounded valley. Draw a free body diagram of the car at the bottom of the valley. Indicate the direction of the acceleration vector. Is there a maximum or a minimum speed the car must travel? If so, why?
- 1b. A car travels over the top of a rounded hill, radius R . Is there a max speed the car can travel? If so why?
2. A person is sliding a 5.5 kg box up an inclined plane, inclined at an angle of 80° above horizontal, at ground. Neglecting friction, find the minimum force needed to push the box up the incline.
3. A mother pulls a child in a little red wagon such that it accelerates at 0.375 m/s^2 . A second child clings to the back of the red wagon and glides along on roller skates. Given: the mass of the wagon/child system is 30.0 kg, the mass of the roller skating freeloader is 35.0 kg (older child), and Mom is pulling at an angle of 60.0° above the horizontal, how much force is Mom exerting? With how much force does the older child have to cling onto the wagon?
4. A 0.522 kg mass package rests on the roof of a house. The static coefficient of friction is 0.40 and the kinetic is 0.20. The roof is pitched at 25° above the horizontal. Does the package move? If so, find its acceleration.
5. You have a 543 N/m spring, with an initial length of 0.32 m, and a 2.2 kg dolphin statue. You want to compress the spring vertically, on the floor, and have the dolphin barely touch the ceiling, which is 6.3 m high. How far must you compress the spring?
6. You drag your heavy (9.4 kg) backpack over the floor of the physics lab for 3.3 meters at a constant speed of 2.1 m/s. The coefficient of kinetic friction is 0.34. You pull at 60° above the horizontal. Find the work done by each force on the backpack.
7. You release a 0.567 kg cart from 2.2 m along a motion track which is inclined at 5.1° above the horizontal. Neglect friction. At the bottom of the track, the cart smoothly (no loss of energy) rolls to the horizontal via a ramp and strikes a horizontal spring, $k=444\text{ N/m}$. How far does the horizontal spring compress?