***Now, for real fun, let’s do an AP Test question***: *Please hand this in by the end of class!*

The Sojourner rover vehicle shown in the sketch was used to explore the surface of Mars as part of the Pathfinder mission in 1997. **The same Sojourner rover that was prominently featured in the recent Hollywood blockbuster The Martian**. *Use the data in the tables below to answer the questions that follow*.

Determine answers for tests done on earth

Sojourner Data:

Mass of Sojourner vehicle: 11.5kg

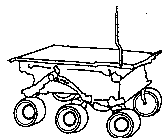
Wheel diameter: 0.13 m

Stored energy available: 5.4 x l05 J

Power required for driving under average conditions: 10.0 W

Land speed: 6.7 x 10-3 rn/s

We will calculate the answers based on the thing being on the earth.



1. Assume that when leaving the Pathfinder spacecraft Sojourner rolls down a ramp inclined at 20° to the horizontal. The ramp must be lightweight but strong enough to support Sojourner. ***Calculate the minimum normal force that must be supplied by the ramp***.
2. What is the net force on Sojourner as it travels across the earth’s surface at constant velocity? Justify your answer.
3. Determine the maximum distance that Sojourner can travel on a horizontal earth’s surface using its stored energy.
4. Suppose that 0.010% of the power for driving is expended against atmospheric drag as Sojourner travels on the surface. Calculate the magnitude of the drag force.

***Solution:***

1. Draw a FBD:





1. Since the thing is moving at a constant velocity, the sum of the forces is zero. Therefore the net force acting on the thing is zero.

3. 



4. Suppose that 0.010% of the power for driving is expended against atmospheric drag as Sojourner travels on the surface. Calculate the magnitude of the drag force.

