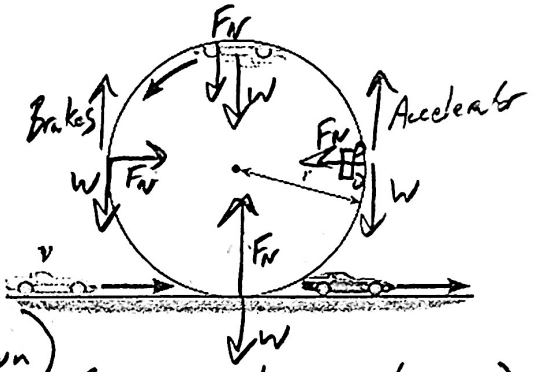
Physics 200 (Stapleton)
Circular Motion, Gravity, Kepler
A Last Bit of Conceptual Practice, etc.

Name: Key

1. Assuming that a car's speed is kept constant on a loop-the-loop, at what location(s) [if ever] in the loop does the net force on the car equal…



a. The centripetal force? Everywhere

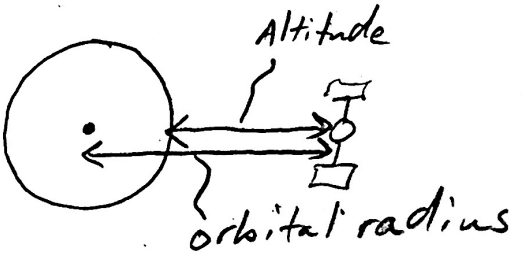
b. The weight of the car? Top, if $F_N = 0$

c. The normal force? Sides (halfway up + halfway down)

d. The weight plus the normal force? Top and bottom (if you do vector addition)

e. The weight minus the centripetal force? Nowhere

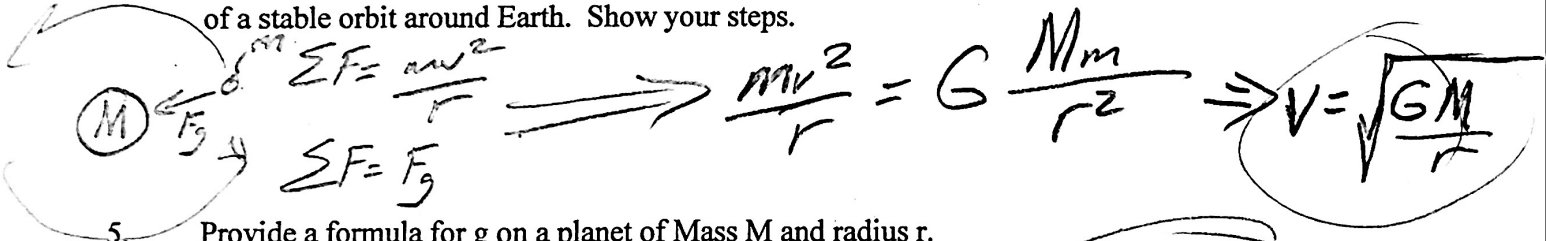
2. Draw a diagram to show the difference between a satellite's altitude and its orbital radius.



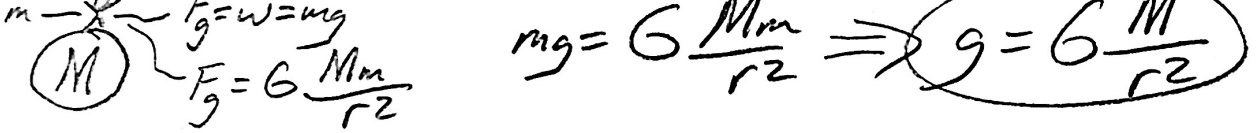
3. A tetherball is rapidly orbiting a central pole. No outside force is being applied to the system. What is pulling the ball away from the pole?

The ball's inertia (momentum)

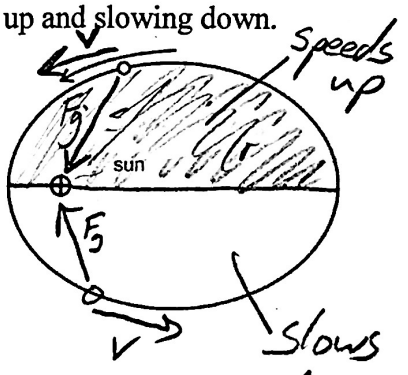
4. Starting with the Universal Law of Gravitation and centripetal force, derive a formula for the speed of a stable orbit around Earth. Show your steps.



5. Provide a formula for g on a planet of Mass M and radius r.



6. On the diagram to the right, label the areas where the planet is speeding up and slowing down.



7. Explain why the planet is speeding up and slowing down in those areas of the diagram.

The planet speeds up when gravity is pulling it in the general direction that it is moving (within 90° of its direction of travel)