

9. Show that the acceleration due to gravity at a height h above the earth can be approximated (for small h) by $g_h = (1 - 2h/R_E)g_0$ where g_0 is just g and R_E is the radius of the earth. What is g_h on top of Mount Everest? Hint: Use the very useful result $(1 + x)^n \approx 1 + nx$ for $x \ll 1$.
10. Find the period of the circular orbit of our sun around the center of our Galaxy (take as point mass $4 \times 10^{41} \text{ kg}$) at a radius 3×10^4 light years.
11. A meteorite $80,000 \text{ km}$ from the earth is moving towards the earth at 2000 m/s . Ignoring air friction what will be its velocity on impact?
12. Calculate the radius of the geosynchronous orbit about the earth.
13. A rocket is launched at escape velocity from the surface of the earth (radius R_E). What is its velocity when it is at a distance r from the center of the earth in terms of G and M_E ?
14. A satellite is in an elliptical orbit around the earth with altitudes ranging from 230 to 890 km . At the high point it is moving at 7.23 km/s . What is its speed at the low point?

FIG. 1. The pulley is massless. Initially and finally all masses are at rest.