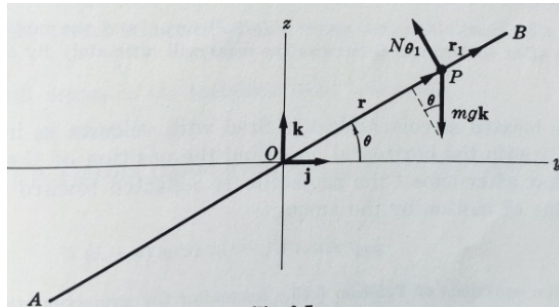


# Classical Mechanics

Do two of the following three problems, each on a separate sheet (or sheets). Attach each set to a provided cover sheet with your name, subject, and problem number.

## Problem 1

The Rod  $AOB$  rotates in a vertical plane (the  $yz$  plane) about a horizontal axis through  $O$  perpendicular to this plane (the  $x$  axis) with constant angular velocity  $\omega$ . Assuming no frictional force, determine the motion of a particle  $P$  of mass  $m$  which is constrained to move along the rod.



## Problem 2

At perigee, an Earth satellite is at an altitude of 300km and is going 100 km/s. Find its altitude at apogee.

(Useful constants:  $G = 6.67 \times 10^{-11} \text{N m}^2 \text{kg}^{-2}$ ;  $M_E = 6 \times 10^{24} \text{kg}$ ;  $R_E = 6371 \text{km}$ )

## Problem 3

A skier leaves a jump at an angle of  $14^\circ$  with speed 11 m/s. Later, he lands down the slope a distance  $d$  from where he started the jump. If the slope is inclined at  $45^\circ$ , find how far down the slope he landed.