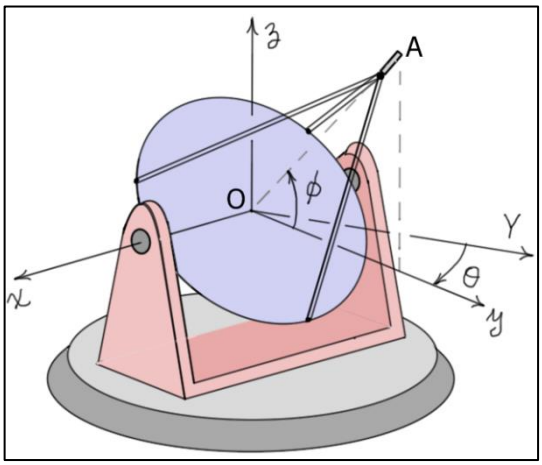
ME 5550 Intermediate Dynamics
Exercises #2A

1) The antenna system shown has two components, the base *B* and the antenna dish *D*. The distance from *O* to *A* is *L*. At any instant, the angle between the rotating *y*-axis and the fixed *Y*-axis is given by the angle θ, and the angle between *OA* and the *y*-axis is given by the angle ϕ. Calculate $\underset{\sim}{v}_A$ and $\underset{\sim}{a}_A$ the velocity and acceleration of point *A* using the formulae for two points ***fixed*** on a rigid body. (The problem comes from Hibbeler, *Engineering Mechanics*, 1998)



2) The system shown has ***three components***, a vertical column *C*, a horizontal arm *M*, and a disk *D*. The disk has radius r and rotates relative to the arm at a rate of ω_3 (rad/sec). The arm has length L and rotates relative to the column at a rate of ω_1 (rad/sec). The column rotates at a rate of ω_2 (rad/sec) relative to the ground. Calculate $\underset{\sim}{v}_A$ and $\underset{\sim}{a}_A$ the velocity and acceleration of point *A* using the formulae for two points ***fixed*** on a rigid body. The angular rates ω_i $(i = 1,2,3)$ are ***not*** constant.