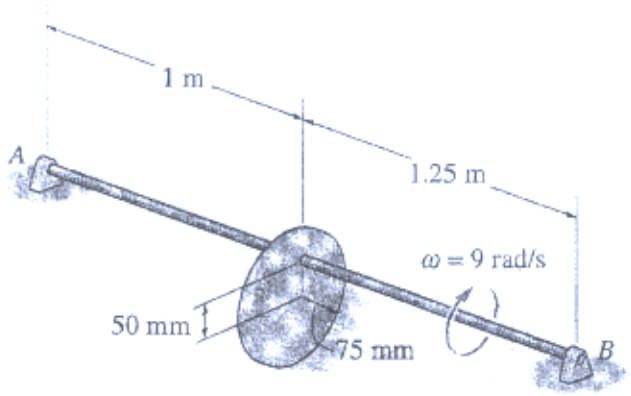
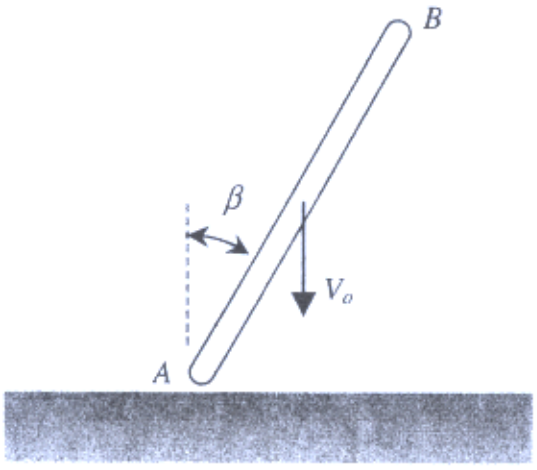
1. The disk, having a mass of 3 kg, is mounted eccentrically on shaft *AB*. If the shaft is rotating at a constant speed of 9 rad/s, determine the reactions at the journal bearing supports when the disk is in the position shown. (20%)



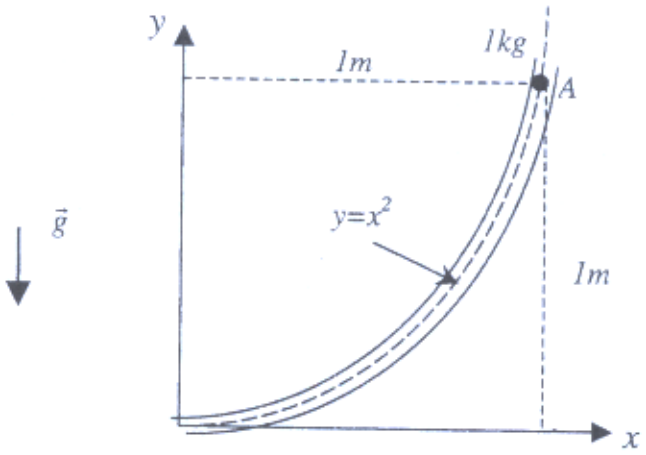
2. The slender rod *AB* of length *L* forms an angle β with the vertical as it strikes the frictionless surface with a vertical velocity V_o and no angular velocity. Assume the impact is perfectly elastic, derive an expression for the angular velocity of the rod immediately after the impact. (20%)



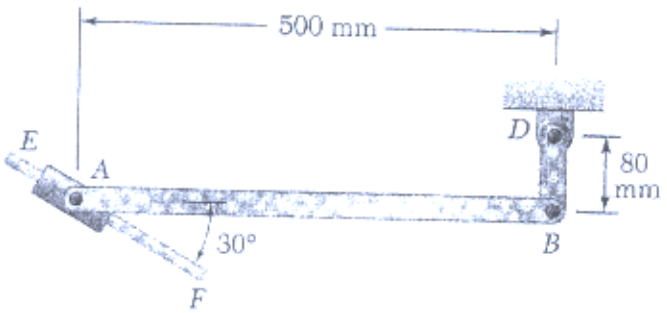
(背面仍有題目,請繼續作答)

3. As shown in the figure, a particle of mass $1kg$ can move along a channel defined by $y=x^2$ on the vertical x-y plane. Besides gravitational force ($m\vec{g}$), there is another force acting on the particle on the x-y plane and is described as

$\vec{F}(x, y) = -(x^2 + 2xy)\,\vec{i} - (x^2 + 2)\,\vec{j}$ (Nt). If the particle is released from rest at position A, please determine the velocity when the particle reaches the origin point, $(x, y) = (0, 0)$. Neglecting all friction forces. (20%)



4. The 3 kg uniform rod AB is connected to crank BD and to a collar of negligible mass, which can slide freely along rod EF. Knowing that in the position shown crank BD rotates with an angular velocity of 15 rad/s and an angular acceleration of 60 rad/s^2, both clockwise, determine the reaction at A. (20%)



5. A circular disc is shown with a circular hole. It rests on a frictionless surface. A force $F = 100\ Nt$ acts on the disc as shown. The thickness of the disk is 0.01 m and density is 2000 kg/m^3. What is (a) the initial angular acceleration of the disc, and (b) the initial linear acceleration of the disc center (point O)? (20%)