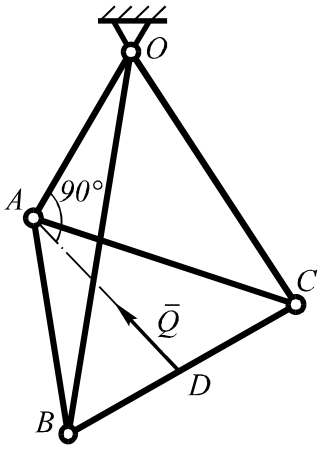
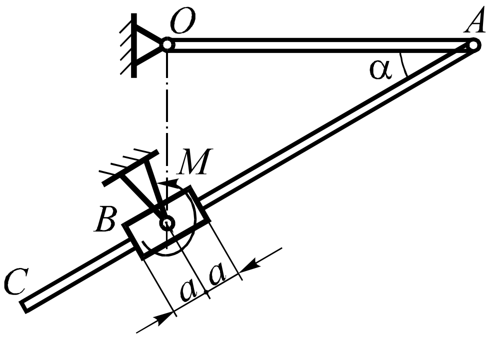


Problem S1–2016

A homogeneous plate *ABC* of weight *P*, has a form of equilateral triangle and it is hanged by three weightless rods. The rods are linked to the corners of the plate by spatial hinges. Rod *OA* is located perpendicularly to the plane of the plate. The length of rod *OA* is equal to the length of the side of the triangle *ABC*. $OB = OC$. The force *Q* is applied at point *D* and it lies in the plane of the triangle. $Q = \frac{P}{2}$.

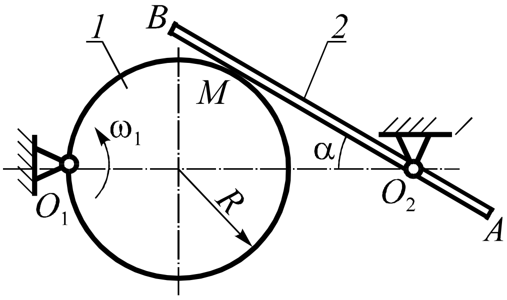
Determine the values of reaction forces inside the rods for the case of the plate equilibrium.



Problem S2–2016

Rods *OA* and *AC* are located in the vertical plane as shown in the figure. The weight of *OA* is *G*, the weight of *AC* is 2*G*. *OA* = *l*, *AC* = 2*l*. $\alpha = 30°$. The rod AC can slide relative to the rough coupling *B*, friction coefficient $f = \frac{\sqrt{3}}{20}$. $a = \frac{l}{5\sqrt{3}}$.

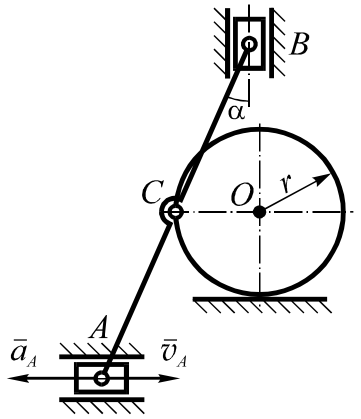
Find the maximal value of the balancing torque *M* applied to the coupling *B* for the case of equilibrium of the described mechanism.



Problem K1–2016

A cam 1 of radius $R = 4\sqrt{3}$ cm rotates with the constant angular velocity $\omega_1 = 2\frac{\text{rad}}{\text{s}}$ and actuates the rod 2. The rod touches the cam at point *M*. $O_2A = 3$ cm.

Define velocity and acceleration of rod 2 at point *A* for the shown position of the mechanism if $\alpha = 30°$.

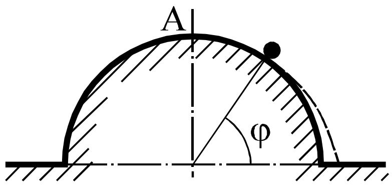


Problem K2–2016

The velocity and acceleration of point *A* located on the rod *AB* are v_A and a_A. respectively. The angle between the rod and the vertical is α. Point *C* is located in the center of rod *AB* and it is connected to the disk of radius *r* by a revolute joint. The disk at its movement always touches the horizontal surface.

Determine the velocity and acceleration of the disk at is central point *O*.

Problem D1–2016

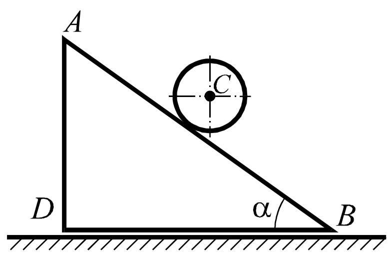


A small body, resting at the highest point A of a hemispherical convex surface, starts to slide down. The body can be considered as a material point.

1. Define the angle φ for the case of point coming off the surface if the surface is smooth.

2. Find the minimal value of the friction coefficient sufficient for the point movement along the surface without their disconnecting.

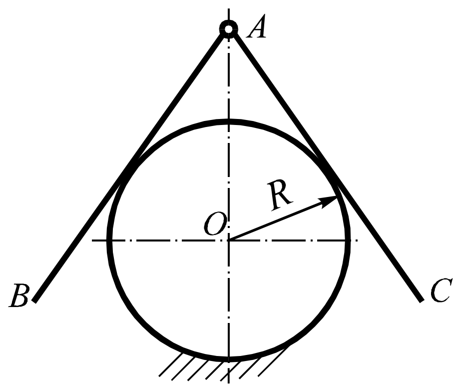
Problem D2–2016



The triangular prism ABD of mass m is located on a smooth horizontal surface. $\alpha = 30°$. A solid homogeneous cylinder of the same mass m rolls along the edge AB of the prism. The friction coefficient between the prism and the cylinder is equal to f.

Determine the acceleration of prism if all bodies rested at the initial moment of time.

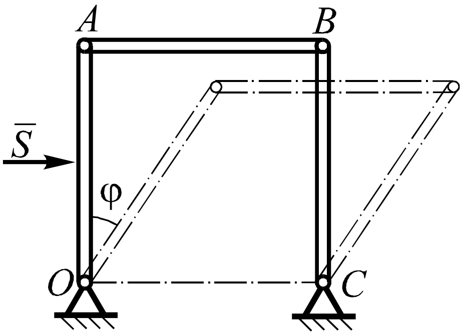
Problem D3–2016



Two identical homogeneous rods AB и AC of length l ($3R < l < 5R$), are linked by hinge A and touch a motionless circle of radius R. Point O is the center of the circle. The system is located in the vertical plane. At the initial moment the velocities of bodies are equal to zero, the initial position of the rods is when $AO = 3R$.

Define the angular velocities and angular accelerations of the rods for the moment when $AO = 2R$. Friction forces are neglected.

Problem D4–2016



Three homogeneous rods of the same length and weight are pivotally connected as it is demonstrated in the figure. $AB = OC = l$. The rods were in a position of stable equilibrium in the vertical plane when the middle point of the left rod was hit by a horizontal shock impulse S.

Find out the value of the angle φ for the case when the rod OA angular velocity is 2 times more than its value directly after the impulse hit.