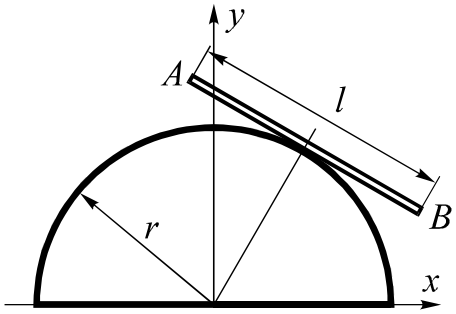
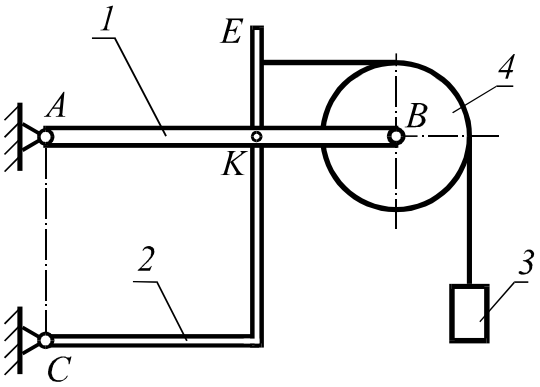
Problem S1–2014



Homogeneous thin rod AB of length l is based on the half-cylinder of radius r. Static friction coefficient between the rod and the half cylinder is equal to f, the coefficient of rolling friction is δ.

Find the maximal possible value of the x coordinate of the rod point B for the case of rod's equilibrium.

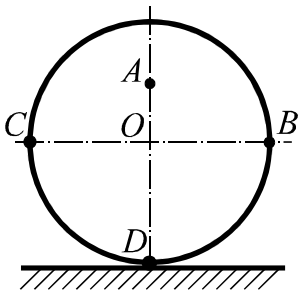
Problem S2–2014



The construction shown in the figure consists of two weightless rods 1 and 2, which are connected at point K by a hinge. The load 3 is linked with the rod 2 by the weightless thread thrown over the block 4. The load 3 and block 4 have the same mass. Block 4 has the radius r, $KB = 2r$, $AK = 3r$.

Determine the distance AC when the reaction forces at points A and C are different in 2 times.

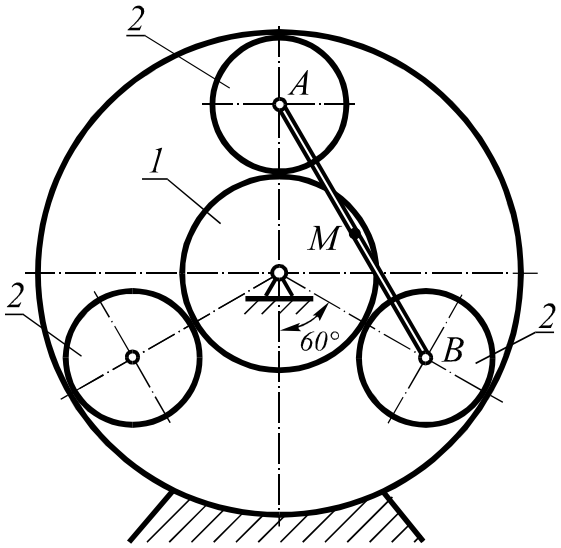
Problem K1–2014



Disk of radius r is rolling on a horizontal surface with slipping. It has a constant angular velocity. The points A and B have the same velocity and acceleration. $OA = r / 2$.

Find the ratio of velocities and accelerations of points C and D.

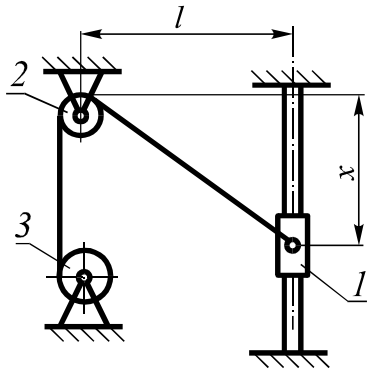
Problem K2–2014



For the shown position of the planetary mechanism the angular velocity and angular acceleration of the central wheel 1 are ω_1 and ε_1 respectively. The radius of wheel 1 is r_1 and the radius of wheel 2 is r_2.

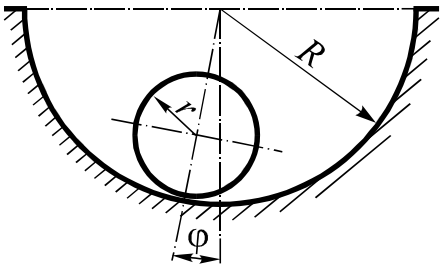
Point M moves along the rod AB and is currently in its center. Find the relative velocity of the point M, considering the fact that the vector of its absolute acceleration is directed along the rod AB at the current moment of time.

Problem D1–2014



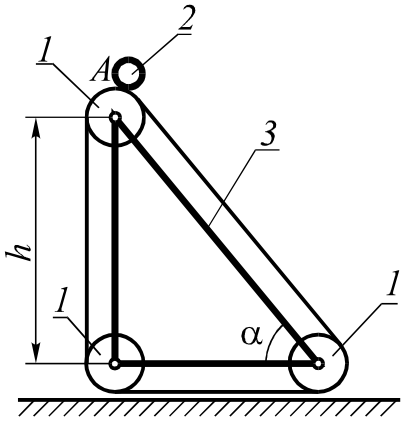
The load 1 of mass m rises along the vertical rod by the rope thrown over the block 2 (its sizes can be neglected). The block 2 is hanged at a distance l from the rod. The coefficient of friction between the load 1 and the rod is f. Determine the dependence of the rope tension force T on the distance x, if the rope is wounded on a uniformly rotating wheel 3 with a linear velocity v_0 .

Problem D2–2014



A solid homogeneous disk of radius r rolls without slipping along the arc of a circle of radius R. Find out the velocity which should be given to the center of the disk at its lower position for the decreasing of the normal cylinder pressure force in 1.5 times for the position of the disk when the angle $\varphi = 60$ °.

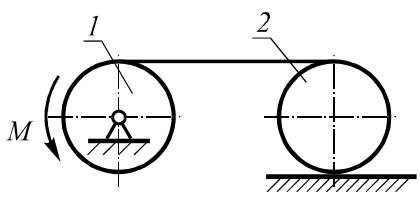
Problem D3–2014



Each of three identical homogeneous cylinders 1 have mass m and radius r. The weightless inextensible belt is thrown over all cylinders (like a conveyor). The material point 2 of the mass $2m$ is located on a fixed conveyor in the highest point A, then the system starts to move. Body 2 does not slip on the belt and it comes off immediately after the contact with the lower cylinder at the right side of the system. Friction in the hinges and between the belt and the horizontal surface is negligible.

Determine the maximal velocity of the construction 3, if its mass is equal to $3m$. The distance h and the angle α are known.

Problem D4–2014



Homogeneous cylinder 1 rotates around a fixed axis under the action of pair of forces. It is connected with the same cylinder 2 with a non-stretchable thread. The cylinder 2 rolls on a horizontal surface.

Two cases are possible: a) cylinder 2 is rolling without slipping; b) there is no friction between the cylinder 2 and the horizontal surface. Find out for which of these cases the value of angular acceleration of cylinder 1 is higher and how many times compared with the other case.