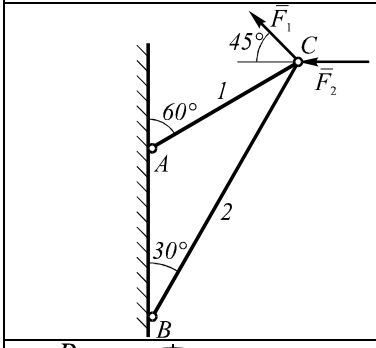
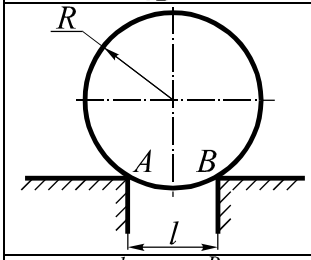
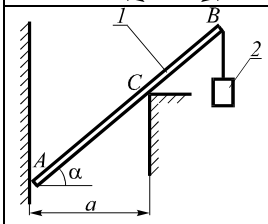
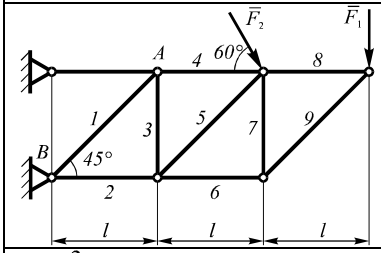
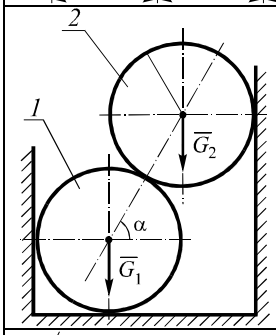
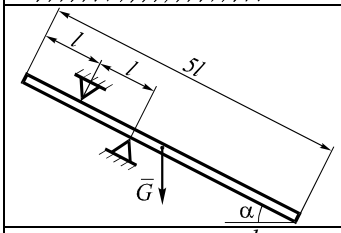
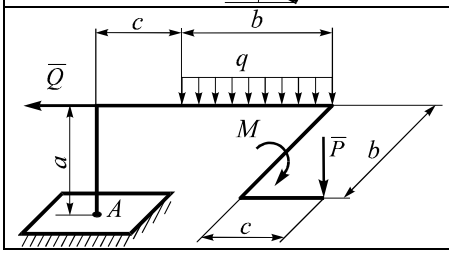
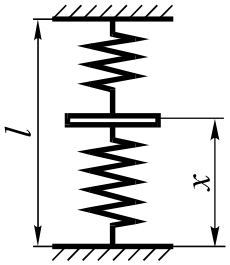
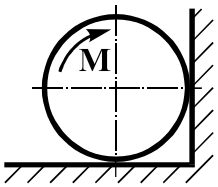
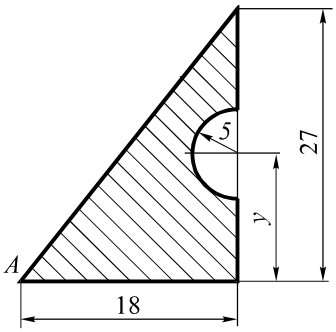
Statics	
	1. The forces F_1 and F_2 are equal to 5 N and 30 N relatively. Rods are weightless. Calculate the reaction force in the rod 2.
	2. The homogeneous sphere of 30 N weight rests on the smooth surface at points A and B. The radius of the sphere R is equal to 20 cm. Find the surface reaction force at point A, if l = 20 cm.
	3. A weightless rod 1 of length l touches the vertical surface at point A and rests at point B on the ledge. The load 2 of weight G is attached to the end of the rod 1 at point B by the thread. The friction is neglected. Find the value of angle α if the distance a is known.
	4. Find the force acting in the rod 5 of the shown truss, if F_1 = 10 kN, F_2 = 20 kN.
	5. Determine the force of the cylinder 1 pressure on the vertical wall if G_1 = 15 N; G_2 = 30 N, α = 60°.
	6. Find the minimal value of the friction coefficient for the case of the shown homogeneous rod equilibrium, considering α = 30°.
	7. Find the moment of the fixation at point A, if P = 5 N; Q = 30 N, q = 2 N/m; M = 10 $N{\cdot}m$, a = 4m, b = 5 m, c = 3 m.

	8. Thin plate of mass m is put between two vertical springs. The free length of each spring is l. Under the action of force P the upper spring is compressed by Δl_1, the lower – by Δl_2. Determine the size of length x at the equilibrium.
	9. The homogeneous disc of weight P and the radius R rests on a rough horizontal surface and contacts with the rough vertical wall. The sliding friction coefficients for both planes are equal to f. Evaluate the value of pair of forces moment M applied to the disk for the case of its equilibrium.
	10. A semicircle of 5 cm radius was cut from the rectangular triangle. Define the distance y, if the center of gravity of the resulting figure is located on distance 15 cm from point A.

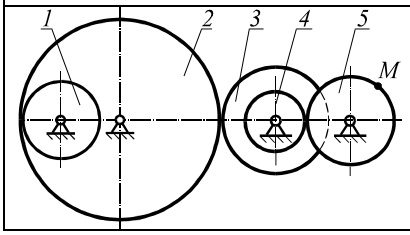
Kinematics

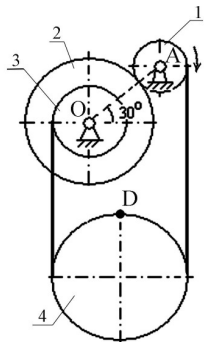
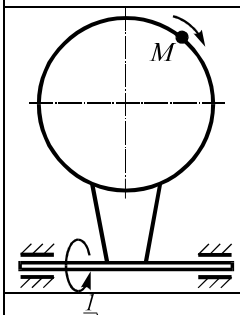
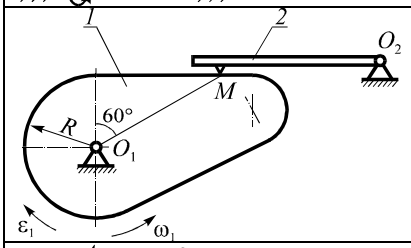
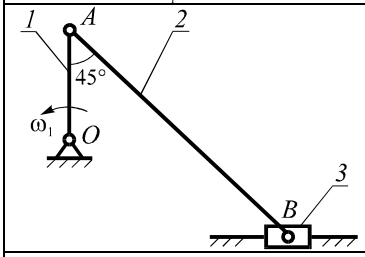
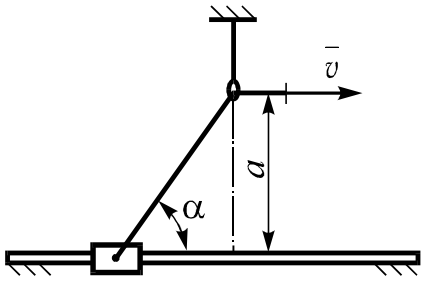
11. Find the curvature radius of the point A trajectory if its coordinates change by the following laws: $x(t) = 5 - 2\sin\dfrac{\pi t}{2}$; $y(t) = 4\cos^2\dfrac{\pi t}{4} - 9$.

12. The material point moves and its covered distance is proportional to the difference between the initial velocity v_0 and the velocity v at the present moment. The coefficient of proportionality is k. Determine the dependence of the point velocity on the time.

13. The point starts to move from the rest along a circle of radius $r = 200$ m with a constant tangential acceleration of 1 m/s^2. Determine the total acceleration of the point at time $t = 20$ sec.

14. The tangential acceleration of a point changes by the law $a_\tau = 2\pi t$, cm/sec^2. The point is at a distance of 5 cm from the axis of a rotating body. Determine its normal acceleration after 3 seconds after the start of body movement.

	15. Determine the ratio $\dfrac{\omega_5}{\omega_1}$ of the angular velocities, if radii r_1, r_2, r_3, r_4, r_5 are known.

3. 	16. Determine the velocity of the point D, located on a wheel 4 rim, if r_1 = 0,2 m; r_2 = 1,0 m; r_3 = 0,3 m; ω_1 = 4 rad / sec.
	17. The point M moves along a rotating body with a constant relative velocity u. The angular velocity of the body ω. Find the maximal Coriolis acceleration.
	18. Define ω_2, if $\omega_1 = 4\dfrac{rad}{\sec}$; $R = 5$ cm; $O_2M = 10$ cm.
	19. Calculate a_B, if $\omega_1 = 2\dfrac{\text{rad}}{\sec}$; $\varepsilon_1 = 0$; $OA = 12$ cm; $AB = 30$ cm; $BC = 10$ cm.
	20. The slide block can move along a guide rail. The rope is attached to the block from the one side and is threaded through the ring from the other side. The rope moves through the ring with the constant velocity v. Determine the acceleration of the slide block when the angle between the rope and the guide rail is equal to α. The distance between the guide rail and the ring is equal to a.

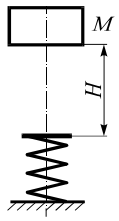
Dynamics

21. Three constant forces F_1, F_2, F_3 in the same direction act the material point of 3 kg mass, and give point the acceleration of 3 m/sec^2. The ratio of the forces modules is 1:2:3 relatively. Find the value of force F_3.

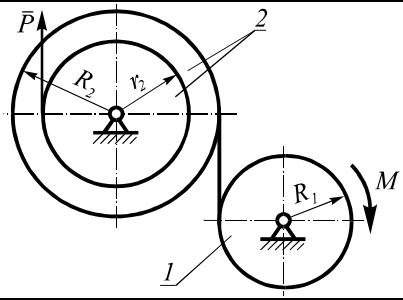
22. The dynamic equation of the material point motion is $2\ddot{x} + 2\dot{x} + cx = 0$.

Find the minimal value of the stiffness coefficient c for the case of the damped oscillations.

23. A body was thrown at angle α_0 to the horizontal. The initial velocity of the body was v_0. Calculate the time spent on the reaching of point maximal height.



24. The load M of mass m = 0,5 kg falls without initial velocity from the height H = 1,2 m and reaches the spring with the stiffness coefficient c = 196 N/m. Determine the value of maximal spring compression h.

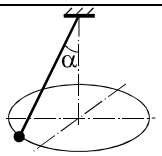


25. Find the angular acceleration of the body 2, if m_1, m_2, R_1, R_2, r_2, i_{1x}, i_{2x} , P and M are known.

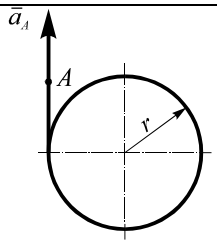
26. A kettlebell of the clock mechanism has a 6 *kg* mass and drops to 120 cm per 24 hours. Determine the gravity force of the kettlebell.

27. A rocket moves vertically upwards with a constant acceleration a. Evaluate the time which the rocket needs to have the three times less mass if the gas relative velocity u is constant and the resistance of the atmosphere is neglected.

28. A hammer of 0.6 kg mass strikes the anvil with a velocity v = 10 m/sec. The impact lasted 0.0003 sec. Determine the average force of the impact if it is inelastic.



29. The motion trajectory of a material point of mass m in the horizontal plane is equal to a circle. The point is hanged by a thread of length l, the angle of deviation from the vertical is α. Find the velocity of the point.



30. The thread is wounded on the homogeneous cylinder of mass m and radius r. A free end A of the thread moves vertically with a constant acceleration a_A.

Determine the acceleration of the cylinder center of mass.