



SW n° 5 of Mechanics Material point dynamics

Exercise 1

A man pushes a 20 kg lawnmower with a force of 80N directed parallel to the handle, which is inclined at 30° to the horizontal.

1. If moving at constant speed, what is the modulus of the friction force due to the ground?
2. What force parallel to the handle would produce an acceleration of 1 m/s^2 , given that the friction force is that found in question 1?

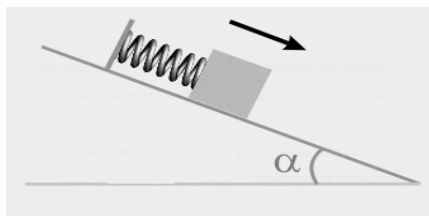
Exercise 2

A block of mass m ascends along a plane inclined by an angle α , with respect to the horizontal, with initial velocity v_0 , and coefficient of friction f_d .

1. Determine how far the block travels before coming to rest.
2. What is the maximum value that the static friction coefficient f_s can take for the body to remain stationary.
3. For a value of the dynamic friction coefficient f_d lower than the maximum value found in the second question, what is the velocity v_1 of the body when it returns to its starting position.

Exercise 3

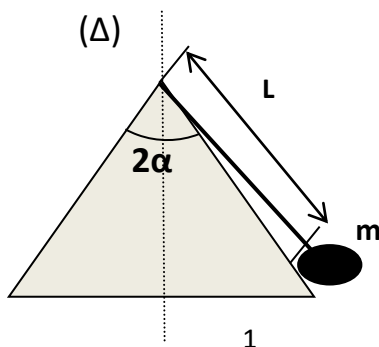
A mass $m = 15\text{ kg}$ suspended from a spring of stiffness $K = 100\text{ N/m}$ descends along an inclined plane which makes an angle $\alpha = 30^\circ$ with the horizontal. Assuming there is no friction, determine the normal reaction of the support and the acceleration of the mass when the spring is stretched by a length $x = 0.02\text{ m}$.



Exercise 4

A body of mass ($m=1\text{ kg}$) is attached by a wire of length $L=30\text{ cm}$ to the top of a cone, of axis (Δ) and angle at the top $2\alpha=60^\circ$. This body rotates without friction on the surface of the cone with a rotational speed $\omega=10\text{ rpm}$. ($10.2\pi/60\text{ s}$)

1. Calculate the body's linear velocity.
2. Using the fundamental principle of dynamics, determine the reaction (R_N) of the cone surface on the body and the thread tension (T).





Additional exercise:

A block (M) of mass m is thrown from the top of an inclined plane $AB=1\text{m}$ at an angle $\alpha=45^\circ$ to the horizontal, with initial velocity $v_A=1\text{m/s}$.

1- Knowing that the coefficient of friction $\mu=0.5$ on AB .

- Demonstrate, what is the nature of the motion on AB ?
- Calculate the speed of (M) when it reaches point B.

2- Friction forces are considered negligible on the horizontal plane:

- Demonstrate the nature of the motion on the horizontal plane.
- Will the block (M) stop? Justify your answer.

