[1]. Given two vectors: $\mathbf{A} = -\mathbf{i} + 3\mathbf{j} - \mathbf{k}$ and $\mathbf{B} = 2\mathbf{i} - \mathbf{j} + 3\mathbf{k}$. Find
(a) $\mathbf{A} \cdot \mathbf{B}$
(b) $\mathbf{A} \times \mathbf{B}$
(c) the angle between the vectors


[2]. A fly of mass 0.2 grams sits 12 cm from the center of a horizontal disk revolving at 33 rpm.
(a) What is the magnitude of the centripetal force on the fly?
(b) What is the minimum value of coefficient of static friction between fly and the disk to prevent the fly from sliding off?


[3]. In the given figure, the coefficient of static friction between the inclined plane and mass $m_1$ is 0.283. Assume that the pulleys are frictionless and have no masses.
(a) Show that the acceleration of mass $m_1$ is twice of the acceleration of mass $m_2$ (i.e. $a_1 = 2a_2$).
(b) Find the acceleration of each block.
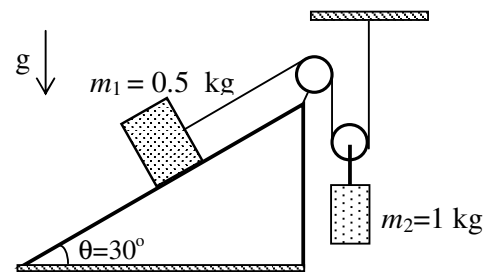



[4]. A block is thrown up frictionless ramp whose height $h = 5$ m and base $d = 4$ m with an initial velocity $v_0 = 10$ m/s as shown in Figure. Find

(a) the maximum height, $H_{max}$, reached by the object
(b) the range, $x$
(c) the velocity both magnitude and direction of the object just before hits the ground
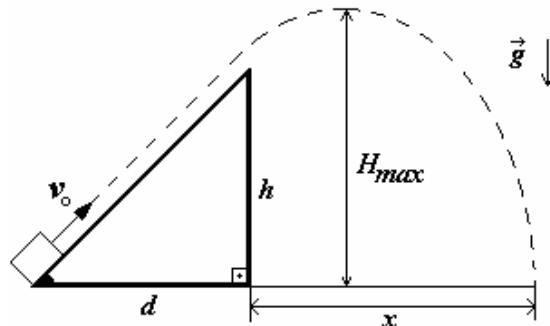



[5]. An object falls from rest from a window that is 6.2 m above the ground.
(a) What is the object's speed as it hits the ground?
(b) How far has the object fallen after 0.5 s?
(c) What is the object's speed at $t = 0.5$ s?


*Useful constants*:
$g = 9.8$ m/s$^2$, sin30°=0.5, cos30°=0.86, sin45°=cos45°=0.71