

- 1 A small body of mass  $m$  was at rest on a horizontal surface. At time  $t = 0$ , a time varying force  $F(t) = bt$  is applied on the body, where  $b$  is a constant. The direction of the force forms a constant angle  $\alpha$  with the horizontal (see figure 1). The acceleration due to gravity is given by  $g$ .

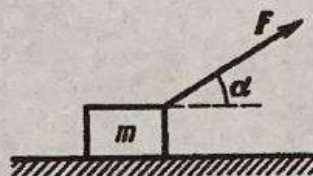


Figure 1: Figure for problem 1.

- (a) Draw a free-body diagram of the entire system. [2]
- (b) Find the time ( $T$ ) when the body breaks off the surface. (Hint: at this moment, the action and reaction forces between the body and the surface become zero.) [3]
- (c) Determine the velocity ( $v$ ) of the body as a function of time before it breaks off the surface, i.e., determine  $v(t)$  for  $t \leq T$ . Find the velocity at the moment the body breaks off the surface. [7+3]
- (d) Find the total distance traversed by the body before it breaks off the surface. [10]