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 α with the horizontal (see figure 1). The acceleration due to gravity is given by g.

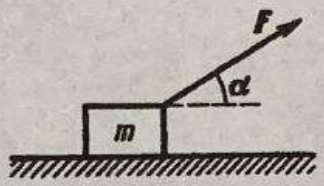

Figure 1: Figure for problem 1.

(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]