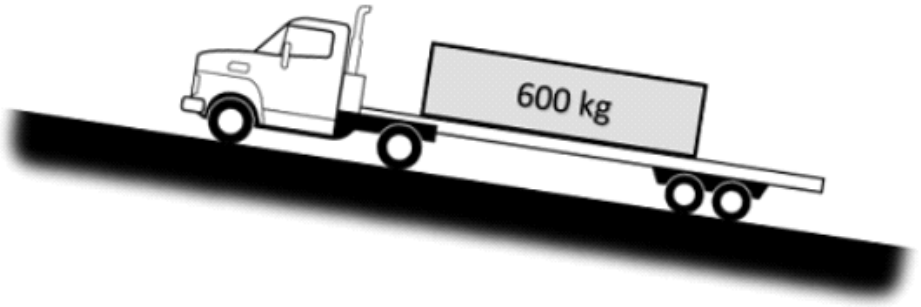
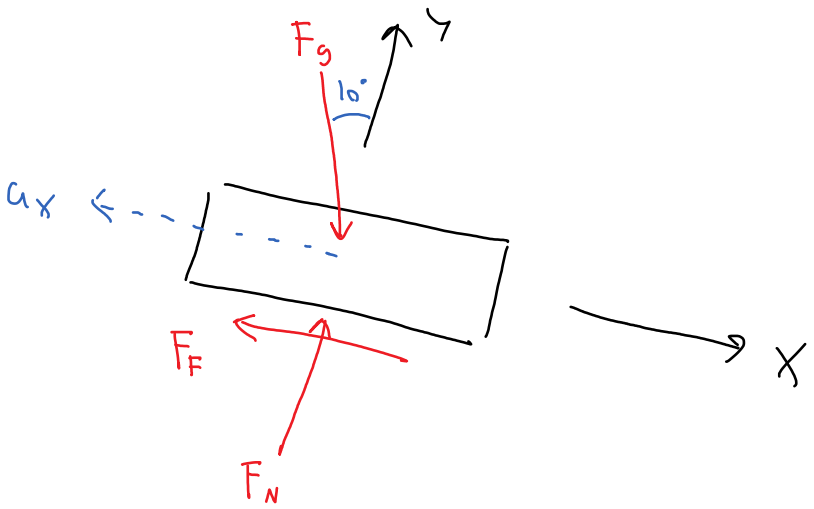
Problem 2

A man in a flat bed truck starts from rest up a hill at an angle of 10 degrees. If he is carrying a 600 kg crate in the back and the static coefficient of friction is .3, what is the maximum rate of acceleration before the crate slides off of the back of the truck? How long will it take the truck to reach a speed of 25 m/s?





$$\sum F_x = -F_F + (600)(9.81)(\sin(10)) = (600)(-a_x)$$

$$\sum F_y = F_N - (600)(9.81)(\cos(10)) = 0$$

impending motion $F_F = .3F_N$

$$F_N = 5796.6\,N \rightarrow F_F = 1738.97\,N$$

$$a_x = \frac{(1738.97) - (600)(9.81)(\sin(10))}{600}$$

$$\boxed{a_x = 1.19 \text{ m/s}^2}$$

$$\downarrow$$

$$V(t) = 25 \text{ m/s} = a(t)$$

$$\boxed{t = 20.9 \text{ s}}$$