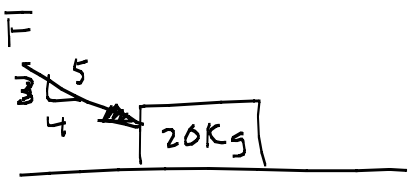
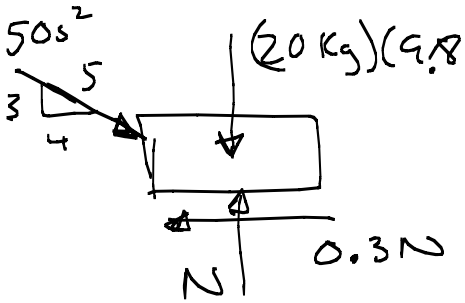
14.11 $F = 50s^2$

$v_{initial} = 2 m/s$



Determine: The distance the block slides before $v = 15 m/s$

$\mu_K = 0.3$



$$T_1 + \sum U_{1-2} = T_2$$

$$T_1 = \frac{1}{2}(20kg)(2 m/s)^2 = 40 N \cdot m$$

$$U_F = \int_0^s \frac{4}{5} F\, ds = \int_0^s \left(\frac{4}{5}\right) 50s^2\, ds = 13.33 s^3$$

$$U_{friction} = -\int_0^s 0.3N\, ds$$

$$= -\int_0^s 0.3(30s^2 + 196.2)\, ds$$

$$+\uparrow \sum F_y = 0 \Rightarrow -\left(50s^2\right)\left(\frac{3}{5}\right) - 196.2 + N = 0$$

$$N = 30s^2 + 196.2$$

$$= -\int_0^s (9s^2 + 58.86)\, ds = -3s^3 - 58.86s$$

$$T_2 = \frac{1}{2}(20\,kg)(5\,m/s)^2 = 250$$

$$40 + 13.33s^3 - 3s^3 - 58.86s = 250$$

$$10.33s^3 - 58.86s - 210 = 0$$

Solving

$$\boxed{s = 3.41\,m}$$