

38. (I) Suppose that you are standing on a train accelerating at  $0.20g$ . What minimum coefficient of static friction must exist between your feet and the floor if you are not to slide?

44. (II) Drag-race tires in contact with an asphalt surface have a very high coefficient of static friction. Assuming a constant acceleration and no slipping of tires, estimate the coefficient of static friction needed for a drag racer to cover  $1.0 \text{ km}$  in  $12 \text{ s}$ , starting from rest  $(V_0 = 0)$ .

Handwritten solution for problem 44:

$\Delta x = V_0 t + \frac{1}{2} a t^2$   
 $1000 \text{ m} = \frac{1}{2} a (12 \text{ s})^2$   
 $a = 13.9 \text{ m/s}^2$

$\mu = \frac{13.9 \text{ m/s}^2}{9.8 \text{ m/s}^2} = 1.42$

$\mu_s \geq \frac{a}{g}$

$\Sigma F = F_{Fr} = \mu F_N = \mu mg$   
 $\Sigma F = ma$   
 $\mu mg = ma$

47. (II) A box is given a push so that it slides across the floor. How far will it go, given that the coefficient of kinetic friction is  $0.20$  and the push imparts an initial speed of  $4.0 \text{ m/s}$ ?

Handwritten solution for problem 47:

$\Sigma F = F_{Fr} = \mu F_N = \mu mg$   
 $\Sigma F = ma$   
 $\mu mg = ma$   
 $0.2 (9.8 \text{ m/s}^2) = a$   
 $1.96 \text{ m/s}^2 = a$  (leftward)

$V_f^2 = V_0^2 + 2a\Delta x$   
 $0 = (4 \text{ m/s})^2 + 2(-1.96 \text{ m/s}^2)\Delta x$   
 $0 = 16 \text{ m}^2/\text{s}^2 - 3.92 \text{ m/s}^2 \Delta x$   
 $\Delta x = 4.08 \text{ m}$