1. (30) When the driver fully applies the brakes of a light truck traveling at 45 km/h, it skids 10 m before coming to a stop. How far will the truck skid if it is traveling at 90 km/h when the brakes are applied?

2. (30) The 15-kg cart B is initially at rest when a 5-kg suitcase A is thrown horizontally on it at 3 m/s. Assuming the kinetic coefficient of friction between A and B is 0.4 and neglecting friction between B and the ground, determine
   (a) the final velocity of A and B
   (b) the length of time that A slides relative to B

3. (40) A car accident occurs as follows: The driver of car A (1800 kg) is traveling on a dry, level road and approaches a stationary car B (900 kg). Just 15 m before collision, he applied the brakes, skidding all wheels. After impact, car A skids an additional 15 m and vehicle B, whose driver had all brakes fully applied, skidded 30 m. The final positions of the cars are shown below. If the coefficient of kinetic friction is 0.9, was the driver of car A exceeding the speed limit of 110 km/h before the initial application of his brakes?

Useful equations

Work and energy: \( T_1 + U_{1\rightarrow 2} = T_2 \)

Work of a spring force: \( U_{1\rightarrow 2} = \frac{1}{2} k\chi_1^2 - \frac{1}{2} k\chi_2^2 \)

Conservation of energy: \( T_1 + V_1 = T_2 + V_2 \)

Impulse and momentum: \( m\vec{v}_1 + \int_{t_1}^{t_2} \vec{F} dt = m\vec{v}_2 \)

Coefficient of restitution: \( e = \frac{v'_B - v'_A}{v_A - v_B} \)