Two cars approach an intersection as shown. Car 1 weighs 4500 pounds, and has a speed of 55.0 mi/hr; car 2 weighs 3750 pounds, and a speed of 60.0 mi/hr. They collide in a completely inelastic collision at the intersection.

(a) Calculate the direction the wreckage moves after the collision. Express this as an angle measured counterclockwise from the positive x-axis.

(b) If the coefficient of kinetic friction is 0.55 for tires on this road, and the wheels of the car are locked (not rolling), calculate the distance the wreckage slides from the collision point.

\[ m_1 \dot{v}_{1x} = m_1 \ddot{x} + m_2 \dot{v}_{2x} \]
\[ m_2 \dot{v}_{2y} = m_2 \ddot{y} + m_2 \dot{v}_{2y} \]
\[ \dot{x} = \dot{v}_{1x} = \dot{v}_{1x} = 55.0 \text{ mi/hr} \quad \ddot{x} = 0 \]
\[ \dot{y} = \dot{v}_{2y} = -60.0 \sin 35^\circ \text{ mi/hr} \quad \ddot{y} = 6.0 \cos 35^\circ \text{ mi/hr} \]
\[ m_1 = m_1 + m_2 = 8250 \text{ pounds} \]
\[ \ddot{x} = \frac{1}{m_1} (m_1 \dot{v}_{1x} + m_2 \dot{v}_{2x}) \]
\[ = \frac{1}{8250} (4500 \times 55.0 - 3750 \times 60 \times \frac{1}{2}) \]
\[ = 16.36 \text{ mi/hr} = 24.2 \text{ ft/s} \]
\[ \ddot{y} = \frac{1}{m_1} m_2 \dot{v}_{2y} = 2 \times 0.62 \text{ mi/hr} = 34.61 \text{ ft/s} \]

The direction is
\[ \theta = \tan^{-1} \frac{\ddot{y}}{\ddot{x}} = \tan^{-1} 1.44 = 51.2^\circ \]

\[ f = \mu m y \]
\[ \ddot{a} = f = \mu m y \]

\[ S = \frac{\dot{v}^2}{2a} = \frac{17837 \text{ ft/s}^2}{1.1 \times 3.2 \text{ ft/s}^2} = 50.4 \text{ ft} \]