HW7-5 Soln)

Consider conservation of momentum in the horizontal direction. Let the two cars be the system. There are no external forces in that direction. There is no net external force in the vertical direction, but that doesn't matter to the horizontal motion, anyway. Let the signs of the velocities represent their directions.

$m_A v_{1i} + m_B v_{Bi} = m_A v_{Af} + m_B v_{Bf} = 0$ (they stop)

We know that $v_{Ai} = -4v_{Bi}$ and that $m_A + m_B = 90{,}000$ kg

$m_A(-4v_{Bi}) + (90{,}000 - m_A)v_{Bi} = 0$
$-4m_A + 90{,}000 - m_A = 0$
$5m_A = 90{,}000$
$m_A = 90{,}000/5 =$ 18,000 kg
$m_B = 90{,}000 - m_A = 90{,}000\text{-}18{,}000 =$ 72,000 kg