7-3)

Says 'elastic,' assume totally elastic.
Let 'to the right' be positive
$m_1 = 3$ kg   $m_2 = 1$ kg    $v_{1i} = 0.2$ m/s  $v_{2i} = -0.4$ m/s (to the left)
No external forces in the horizontal direction, so momentum is conserved horizontally.
Use relationships given in class:
$v_{1f} = v_{1i}[m_1 - m_2]/[m_1 + m_2]$   and   $v_{2f} = 2m_1v_{1i}/[m_1 + m_2]$
Remember though that these are valid only if $m_2$ were initially at rest.
Use the relative velocity approach:

| | Initial velocities in original frame | Convert | Initial velocities in new frame | Final velocities in new frame | Convert back to original frame | final velocities in original frame |
|---|---|---|---|---|---|---|
| $m_1$ | +0.2 m/s | +0.4 | 0.6 | $v_{1f}' = v_{1i}'[m_1 - m_2]/[m_1 + m_2] =$ 0.6*[3 - 1]/[3 + 1] = 0.3 | -0.4 | -0.1 m/s |
| $m_2$ | -0.4 m/s | +0.4 | 0 | $v_{2f}' = 2m_1v_{1i}'/[m_1 + m_2] =$ 2*3*0.6/[3 + 1] = 0.9 | -0.4 | +0.5 m/s |

b)
For $m_1$:  $\Delta p = m_1v_{1f} - m_1v_{1i} = 3(-0.1 - 0.2) =$ - 0. 9 kg m/s
For $m_2$:  $\Delta p = m_2v_{2f} - m_2v_{2i} = 1(0.5 - -0.4) =$ +0. 9 kg m/s
So momentum was transferred from mass 1 to mass 2, but none was lost.

c)
For $m_1$:  $\Delta K = {}^1/_2m_1v_{1f}^2 - {}^1/_2m_1v_{1i}^2 = 0.5*3*((-0.1)^2 - (0.2)^2) =$ - 0.045 J
For $m_2$:  $\Delta K = {}^1/_2m_2v_{2f}^2 - {}^1/_2m_2v_{2i}^2 = 0.5*0.01*((0.5)^2 - (-0.4)^2) =$ + 0.045 J
So kinetic energy was transferred from mass 1 to mass 2, but none was lost.