Ch 2 - 25, 26, 28

(25) $\Delta p = p_f - p_i = mv_f - mv_i = 0 - (2200\,kg)(25\,m/s) = -55{,}000\,kg\cdot m/s$

Front end goes from 25 m/s to 0 → assume $v_{avg} = 12.5\,m/s$

$$v_{avg} = \frac{\Delta r}{\Delta t} \Rightarrow \Delta t = \frac{\Delta r}{v_{avg}} = \frac{0.8\,m}{12.5\,m/s} = 0.064\,s$$

$$|\vec{F}| = \frac{|\Delta \vec{p}|}{\Delta t} = \frac{55{,}000\,kg\cdot m/s}{0.064\,s} = 8.59 \times 10^5\,N$$

(26) (a) $\Delta \vec{r} = \vec{r}_f - \vec{r}_i = \langle 3.25, 2.50, -9.40\rangle m - \langle 3.17, 2.54, -9.38\rangle m$

$= \langle 0.08, -0.04, -0.02\rangle m$

$$\vec{v}_{avg} = \frac{\Delta \vec{r}}{\Delta t} = \frac{\langle 0.08, -0.04, -0.02\rangle m}{0.025} = \langle 4, -2, -1\rangle m/s$$

$$\vec{p}_{avg} = m\vec{v}_{avg} = (2.7\times10^{-3}\,kg)\langle 4, -2, -1\rangle m/s = \langle 10.8, -5.4, -2.7\rangle \times 10^{-3}\,kg\cdot$$

(b) $\Delta r = \vec{r}_f - \vec{r}_i = \langle 11.27, -1.86, -11.42\rangle m - \langle 11.25, -1.50, -11.40\rangle m$

$= \langle 0.02, -0.36, -0.02\rangle m$

$$\vec{v}_{avg} = \frac{\Delta \vec{r}}{\Delta t} = \frac{\langle 0.02, -0.36, -0.02\rangle m}{0.02\,s} = \langle 1, -18, -1\rangle \frac{m}{s}$$

$$\vec{p}_{avg} = m\vec{v}_{avg} = (2.7\times10^{-3}\,kg)\langle 1, -18, -1\rangle \frac{m}{s} = \langle 2.7, -48.6, -2.7\rangle \times 10^{-3}\,kg\cdot\frac{m}{s}$$

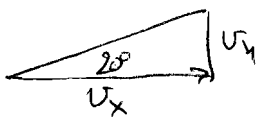
(c) $$\vec{F}_{avg} = \frac{\Delta p}{\Delta t} = \frac{\vec{p}_f - \vec{p}_i}{\Delta t} = \frac{\left[\langle 2.7, -48.6, -2.7\rangle - \langle 10.8, -5.4, -2.7\rangle\right] \times 10^{-3}\,kg\cdot\frac{m}{s}}{2.00\,s}$$

$$= \frac{\langle -8.1, -43.2, 0\rangle \times 10^{-3}\,kg\cdot\frac{m}{s}}{2.00\,s}$$

$$= \langle -4.05, -21.6, 0\rangle \times 10^{-3}\,N$$

(28) (a) B is correct path (others show varying y velocity after impact)

(b)



$$v_y = v_x \tan 20°$$
$$= (3.5\ m/s)(0.364) = 1.27\ m/s$$

$$F_y = \frac{\Delta p_y}{\Delta t} = \frac{mv_y - 0}{\Delta t} = \frac{(0.4\ kg)(1.27\ m/s)}{0.002\ s} = 255\ N$$