PHYS 2311 Ch. 9 HW

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Problem 1.

$$p = mv = (0.032)(8.4) = \boxed{0.2688\,\text{Ns}}$$

Problem 2.

$$m_A\vec{v}_A + m_B\vec{v}_B = m_A\vec{v}'_A + m_B\vec{v}'_B$$

$$(7150)(15.0) + (3650)(0) = (10800)\vec{v}'$$

$$\vec{v}' = \frac{(7150)(15.0)}{10800} = \boxed{9.93\,\text{m/s}}$$

Problem 4.

$$\vec{F}_{\text{inst}} = \frac{d\vec{p}}{dt} = m\frac{d\vec{v}}{dt} + \vec{v}\frac{dm}{dt}$$

$$= 0 + (4.5 \times 10^4)(1200) = \boxed{5.4 \times 10^7\,\text{N}}$$

Problem 5.

$$\vec{p} = 4.8t^2\hat{i} - 8.0\hat{j} - 9.4t\hat{k}$$

$$\vec{F} = \frac{d\vec{p}}{dt}$$

$$\vec{F} = \boxed{(9.6t\hat{i} - 9.4\hat{k})\text{N}}$$

Problem 6.

$$m_B = 42 + 24 = 66$$

$$m_A\vec{v}_A + m_B\vec{v}_B = m_A\vec{v}'_A + m_B\vec{v}'_B$$

$$(5.30)(0) + (66)(0) = (5.30)(10\hat{i}) + (66)(\vec{v}'_B)$$

$$\frac{-(5.30)(10\hat{i})}{66} = \vec{v}'_B = \boxed{-0.803\,\hat{\text{i}}\text{m/s}}$$

Problem 8.

$$\vec{F} = 26\hat{i} - 12t^2\hat{j}$$

$$\Delta\vec{p} = \int_{t_1}^{t_2} \vec{F}\,dt = \int_{1.0}^{2.0} 26\hat{i} - 12t^2\hat{j}\,dt$$

$$26t\hat{i} - 4t^3\hat{j}\Big|_{1.0}^{2.0} = (26(2.0)\hat{i} - 4(2.0)^3\hat{j}) - (26(1.0)\hat{i} - 4(1.0)^3\hat{j})$$

$$= \boxed{(26\hat{i} - 28\hat{j})\text{Ns}}$$

Problem 9.

$$\vec{p}_i = \vec{p}_f$$

$$m_1 v_1 = m_2 v_2$$
$$v_1 = \frac{m_2}{m_1} v_2$$

$$K_1 = 2K_2$$
$$\frac{1}{2} m_1 v_1^2 = m_2 v_2^2$$
$$m_1 v_1^2 = 2m_2 v_2^2$$
$$m_1 \left(\frac{m_2}{m_1} v_2\right)^2 = 2m_2 v_2^2$$
$$\frac{m_2^2}{m_1} = 2m_2$$
$$\frac{m_2}{m_1} = 2$$
$$\frac{m_1}{m_2} = \boxed{\frac{1}{2}}$$

Problem 18.

$$d$$

Problem 21.

Problem 23.

Problem 28.

Problem 37.

Problem 38.

Problem 47.

Problem 54.

Problem 55.