

Solutions

PHYS-205A-001

(Final Exam)

Spring 2023

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Problem 1

$$\text{magnitude} = 9.8 \text{ m/s}^2$$

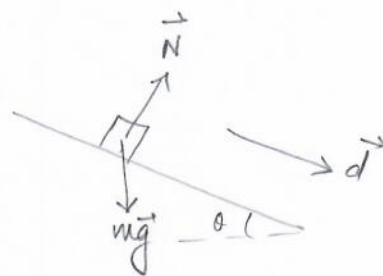
direction = vertically downward

Problem 2

radially inward

Problem 3

$$\begin{aligned} W &= \vec{N} \cdot \vec{d} \\ &= Nd \cos 90 = 0 \end{aligned}$$



Problem 4

Elastic collision conserves kinetic energy, but inelastic collision doesn't. Both conserve momentum.

Problem 5

$$ma = N - mg$$

$$N = mg + ma$$

$$= 75(9.8 + 2.0)$$

$$= 890 \text{ Newton.}$$



$$a = 2.0 \text{ m/s}^2$$



$$\begin{aligned} mg &= (75)(9.8) \\ &= 740 \text{ Newton.} \end{aligned}$$

Problem 6

$$\frac{1}{2} M v_A^2 + \frac{1}{2} I \omega_A^2 + Mgh_A = \text{constant}$$

$$\frac{1}{2} M v_A^2 + \frac{1}{2} M R^2 \omega_A^2 + Mgh_A = \text{constant}$$

$$M v_A^2 + Mgh_A = M v_B^2 + Mgh_B$$

$\downarrow = 0$

$$\downarrow = 0$$

$$v_B = \sqrt{gh_A} = \sqrt{(9.8)(20.)} = 14 \frac{m}{s}$$



Problem 7

$$U = U_{12} + U_{23} + U_{31}$$

$$= - \frac{G m_1 m_2}{a} - \frac{G m_2 m_3}{a} - \frac{G m_3 m_1}{a}$$

$$= - 3 \frac{G m^2}{a}$$

