Solutions

PHYS-205A-002 (Final Exam) Fall 2024

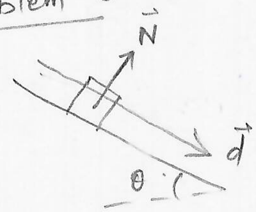
Problem 1

$V_B = V_{0x} = V_0 \cos\theta_0 = (25)\cos 30 = 22\ \frac{m}{s}$

Problem 2

coefficient of friction is a dimensionless quantity.

Problem 3



$W = \vec{N}\cdot\vec{d}$

$= N d \cos 90 = 0$

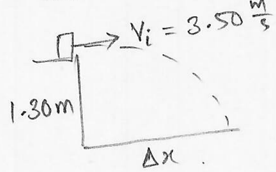
Problem 4

$\frac{2}{5} MR^2 < \frac{2}{3} MR^2$

(solid) (shell)

Thus, a spherical shell experiences a larger rotational inertia

Problem 5



$\Delta t = \boxed{0.52 s}$

$\Delta x =$

$V_{ix} = 3.50\ \frac{m}{s}$

$\Delta t = \boxed{0.52 s}$

$\Delta y = -1.30 m$

$V_{iy} = 0$

$V_{fy} =$

$a_y = -9.8\ \frac{m}{s^2}$.

$\Delta y = V_{iy}\,\Delta t + \frac{1}{2} a \Delta t^2$

$-1.30 = 0 + \frac{1}{2}(-9.8)\,\Delta t^2$

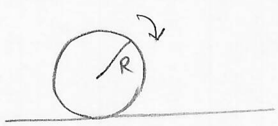
$\Delta t = 0.52$ second.

$\Delta x = V_{ix}\,\Delta t$

$= (3.50)(0.52)$

$= 1.8$ m

Problem 6



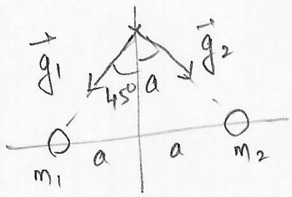
$\Delta t = 8.00 \, sec$ $\quad v_i = 0$ $\quad a =$

$\Delta x =$ $\quad v_f = 24.0 \, \frac{m}{s}$

$$a = \frac{v_f - v_i}{\Delta t} = \frac{24.0 - 0}{8.00} = 3.00 \, \frac{m}{s^2}.$$

$$\alpha = \frac{a}{R} = \frac{3.00}{0.300} = 10.0 \, \frac{rad}{sec^2}$$

Problem 7



$|\vec{g}_1| = |\vec{g}_2|$

$$\vec{g} = \vec{g}_1 + \vec{g}_2$$
$$= 2\,|\vec{g}_1| \cos 45$$
$$= \sqrt{2}\,|\vec{g}_1|$$
$$= \sqrt{2} \, \frac{Gm}{(a^2 + a^2)}$$
$$= \frac{1}{\sqrt{2}} \, \frac{Gm}{a^2}$$