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General Physics I, Quiz 2
PHYS10400, Class year 99
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SN:_______________, Name:________________

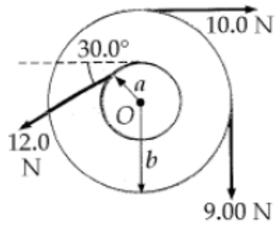
Chapter 10-11, Serway; ABSOLUTELY NO CHEATING!
Please write the answers on the blank space or on the back of this paper to save resources.

1.

$$\sum \tau = 0.100\text{ m}(12.0\text{ N}) - 0.250\text{ m}(9.00\text{ N}) - 0.250\text{ m}(10.0\text{ N})$$

$$= \boxed{-3.55\text{ N}\cdot\text{m}}$$

The thirty-degree angle is unnecessary information.



ANS FIG. P10.35

2.

(a) Use the parallel-axis theorem to find the moment of inertia of the disk:

$$I = I_{CM} + MR^2 \rightarrow I = \frac{1}{2}MR^2 + MR^2 = \frac{3}{2}MR^2$$

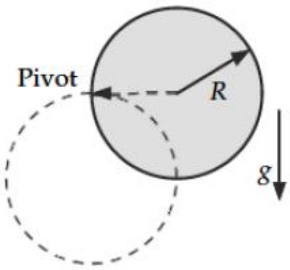
Find the velocity of the CM

$$(K+U)_i = (K+U)_f$$

$$0 + mgR = \frac{1}{2}I\omega^2$$

$$\omega = \sqrt{\frac{2mgR}{I}} = \sqrt{\frac{2mgR}{\frac{3}{2}mR^2}}$$

$$v_{CM} = R\sqrt{\frac{4g}{3R}} = \boxed{2\sqrt{\frac{Rg}{3}}}$$



ANS FIG. P10.53

(b) $v_L = 2v_{CM} = \boxed{4\sqrt{\frac{Rg}{3}}}$

(c) $v_{CM} = R\omega = R\sqrt{\frac{2mgR}{I}} = R\sqrt{\frac{2mgR}{2mR^2}} = \boxed{\sqrt{Rg}}$

3.

(a) $$\vec{\mathbf{A}}\times\vec{\mathbf{B}} = \begin{vmatrix} \hat{\mathbf{i}} & \hat{\mathbf{j}} & \hat{\mathbf{k}} \\ 1 & 2 & 0 \\ -2 & 3 & 0 \end{vmatrix} = \hat{\mathbf{i}}(0-0)+\hat{\mathbf{j}}(0-0)+\hat{\mathbf{k}}(3+4) = \boxed{7\hat{\mathbf{k}}}$$

(b) $$\left|\vec{\mathbf{A}}\times\vec{\mathbf{B}}\right| = \left|\vec{\mathbf{A}}\right|\left|\vec{\mathbf{B}}\right|\sin\theta$$

$$7 = \sqrt{5}\sqrt{13}\sin\theta = \sqrt{65}\sin\theta$$

$$\theta = \sin^{-1}\left(\frac{7}{\sqrt{65}}\right) = \boxed{60.3^\circ}$$

4.

(a) $$L = I\omega = \left(\frac{1}{2}MR^2\right)\omega = \frac{1}{2}(3.00\text{ kg})(0.200\text{ m})^2(6.00\text{ rad/s}) = \boxed{0.360\text{ kg}\cdot\text{m}^2/\text{s}}$$

(b) $$L = I\omega = \left[\frac{1}{2}MR^2 + M\left(\frac{R}{2}\right)^2\right]\omega$$

$$= \frac{3}{4}(3.00\text{ kg})(0.200\text{ m})^2(6.00\text{ rad/s}) = \boxed{0.540\text{ kg}\cdot\text{m}^2/\text{s}}$$