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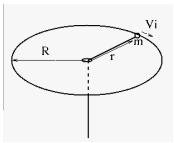
1. (1 point)

Student Name: Arfaz Hossain
Student ID: V00984826

A ball of mass $m = 3.67\text{kg}$ moves in a circle of radius $R = 5.79\text{m}$ at constant speed on a horizontal and frictionless surface.
The ball is moving at speed $|\vec{v}_i| = 8.27\frac{\text{m}}{\text{s}}$.
It is forced to move in this circle by a rope which is attached to the ball and goes through a hole at the origin.



(The input below will accept answers with no more than 1

What is the tension in the rope?

_____ N

What is the magnitude of the angular momentum of the ball around the origin?

_____ $\text{kg}\frac{\text{m}^2}{\text{s}}$

The rope is pulled to make the ball travel in a smaller circle. When the length of the rope is $r = 5.18\text{m}$ what is the speed of the ball?

_____

UVic Problem ID: 57301611324924130

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Correct Answers:

- 43.351
- 175.732
- 9.244

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2. (1 point)

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A ball of mass $m = 1.05\text{kg}$ has its position as a function of time given by

$\vec{r}(t) = \left(5\text{m} + 1.5\cos\left(0.73\frac{1}{\text{s}}t\right)\right)\hat{i} + \left(5.87\frac{\text{m}}{\text{s}}t\right)\hat{j} + \left(1.87\frac{\text{m}}{\text{s}^2}t^2\right)\hat{k}$

(The input below will accept answers with no more than 1

What is the particle's angular momentum around the origin at $t = 1.24\text{s}$?

$\vec{L}(1.24\text{s}) =$ _____ $\text{kg}\frac{\text{m}^2}{\text{s}}\hat{i} +$ _____ $\text{kg}\frac{\text{m}^2}{\text{s}}\hat{j} +$ _____ $\text{kg}\frac{\text{m}^2}{\text{s}}\hat{k}$

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Correct Answers:

- 17.722
- -31.458
- 43.109

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3. (1 point)

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Three masses are located in the xy-plane as follows:
$m_1 = 3.79\text{kg}$ is at $\vec{r}_1 = 1.10\text{m}\hat{i}$.
$m_2 = 2.45\text{kg}$ is at $\vec{r}_2 = -0.76\text{m}\hat{i} + 1.66\text{m}\hat{j}$
$m_3 = 3.04\text{kg}$ is at $\vec{r}_3 = -0.76\text{m}\hat{i} - 1.33\text{m}\hat{j}$
The masses are rigidly connected to each other and to the origin by massless rods so they make a "y-shape".

(The input below will accept answers with no more than 1

What is the moment of inertia of this mass configuration for rotation around the z-axis?

_____ kgm^2

If the masses are rotating around the origin at the angular speed $\left|\frac{d\theta}{dt}\right| = 2.95\frac{1}{s}$ in such a way that m_1's velocity is in the negative y-direction and the rotation axis is the z-axis, what is the angular momentum of this configuration?

$\vec{L} =$ _____ $\text{kg}\frac{\text{m}^2}{\text{s}}\hat{k}$

What is the moment of inertia of this mass configuration for rotation around the x-axis?

_____ kgm^2

If the masses are rotating around the origin at the angular speed $\left|\frac{d\theta}{dt}\right| = 2.95\frac{1}{s}$ in such a way that m_2's velocity is in the negative z-direction and the rotation axis is the x-axis, what is the magnitude of the angular momentum of this configuration?

_____ $\text{kg}\frac{\text{m}^2}{\text{s}}$

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Correct Answers:

- 19.886
- -58.663
- 12.129
- 35.780

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4. (1 point)

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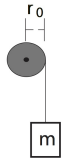
A disk of radius $r_0 = 0.16\text{m}$ is attached at its center to a frictionless axle about which it can rotate.
The disk has a massless rope wrapped around it which supports a mass $m = 23.9\text{kg}$ against gravity as shown in the diagram.



The mass accelerates downwards at a rate $|\vec{a}| = 0.92 \frac{\text{m}}{\text{s}^2}$.

(The input below will accept answers with no more than 1

What is the tension in the rope?

_____ N

What is the magnitude of the angular acceleration $\left|\frac{d^2\theta}{dt^2}\right|$ of the disk?

_____ $\frac{1}{\text{s}^2}$

What is the moment of inertia of the disk?

$I =$ _____ kgm^2

UVic Problem ID: 57301611324924130

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Correct Answers:

- 212.232
- 5.750
- 5.906