HW due 3/27

Due: 11:59pm on Sunday, March 27, 2016

You will receive no credit for items you complete after the assignment is due. Grading Policy

Exercise 9.7

The angle θ through which a disk drive turns is given by $\theta(t) = a + bt - ct^3$, where a,b and c are constants, t is in seconds, and θ is in radians. When $t = 0, \theta = \pi/4$ rad and the angular velocity is 3.10 $\mathrm{rad/s}$, and when 1.60 s , the angular acceleration is 1.35 $\mathrm{rad/s^2}$.

Part A

Find a including their units.

ANSWER:

- $\pi/4$ $\mathrm{rad/s^2}$
- $\pi/2$ $\mathrm{rad/s}$
- $\pi/4$ rad
- $\pi/4$ $\mathrm{rad/s}$

Correct

Part B

Find b including their units.

ANSWER:

- 3.10 $\mathrm{rad/s^2}$
- 3.10 $\mathrm{rad/s}$
- 5.3 $\mathrm{rad/s}$
- 5.3 $\mathrm{rad/s^2}$

Correct

Part C

Find c including their units.

ANSWER:

- -0.141 $\mathrm{rad/s^3}$
- -0.141 $\mathrm{rad/s^2}$
- 3.3 $\mathrm{rad/s^3}$
- 4.5 $\mathrm{rad/s^3}$

Correct

Part D

What is the angular acceleration when $\theta = \pi/4$ rad?

ANSWER:

α = 0 $\mathrm{rad/s^2}$

Correct

Part E

What is θ when the angular acceleration is 2.90 $\mathrm{rad/s^2}$?

ANSWER:

θ = 17.1 rad

Correct

Part F

What is the angular velocity when the angular acceleration is 2.90 $\mathrm{rad/s^2}$?

ANSWER:

ω = 8.08 $\mathrm{rad/s}$

Correct

Exercise 9.10

An electric fan is turned off, and its angular velocity decreases uniformly from 450 $\mathrm{rev/min}$ to 240 $\mathrm{rev/min}$ in a time interval of length 4.35 s .

Part A

Find the angular acceleration in $\mathrm{rev/s^2}$.

ANSWER:

α = -0.805 $\mathrm{rev/s^2}$

Correct

Part B

Find the number of revolutions made by the motor in the time interval of length 4.35 s .

ANSWER:

N = 25.0 rev

Correct

Part C

How many more seconds are required for the fan to come to rest if the angular acceleration remains constant at the value calculated in part A?

ANSWER:

t = 4.97 s

Correct

Exercise 9.13

A turntable rotates with a constant 2.25 $\mathrm{rad/s^2}$ angular acceleration. After 3.50 s it has rotated through an angle of 30.0 rad.

Part A

What was the angular velocity of the wheel at the beginning of the 3.50-s interval?

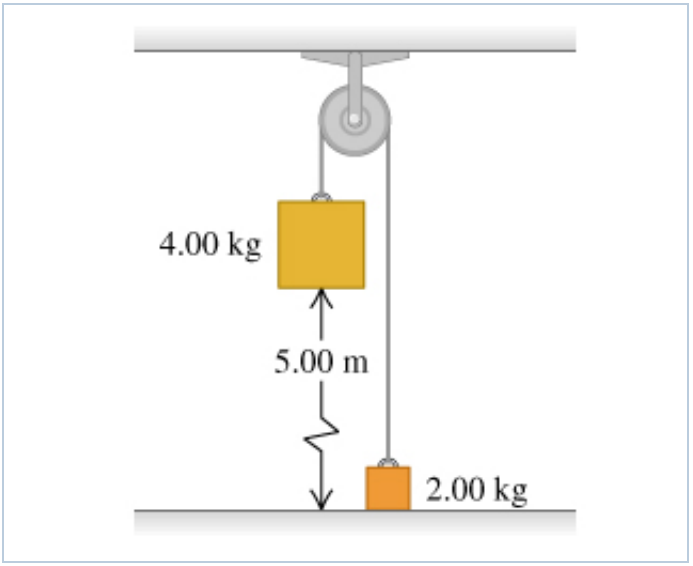
ANSWER:

ω_0 = 4.63 $\mathrm{rad/s}$

Correct

Problem 9.76

The pulley in has radius 0.160 m and a moment of inertia 0.380 $\mathrm{kg \cdot m^2}$. The rope does not slip on the pulley rim.



Part A

Use energy methods to calculate the speed of the 4.00-kg block just before it strikes the floor.

Express your answer with the appropriate units.

ANSWER:

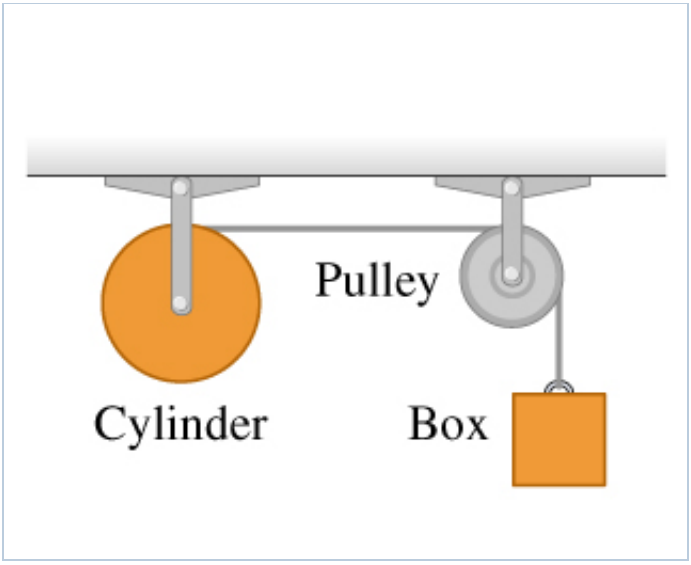
v = 3.07 $\frac{\mathrm{m}}{\mathrm{s}}$

Correct

Problem 9.80

In the following figure , the cylinder and pulley turn without friction about stationary horizontal axles that pass through their centers. A light rope is wrapped around the cylinder, passes over the pulley, and has a 3.00-kg box suspended from its free end. There is no slipping between the rope and the pulley surface. The uniform cylinder has mass 5.00 kg and radius 40.0 cm. The pulley is a uniform disk with mass 2.00 kg and radius 20.0 cm. The box is released from rest and descends as the

rope unwraps from the cylinder.



Part A

Find the speed of the box when it has fallen 2.50 m.

ANSWER:

v = 4.76 $\mathrm{m/s}$

Correct

Exercise 9.32

You are a project manager for a manufacturing company. One of the machine parts on the assembly line is a thin, uniform rod that is 60.0 cm long and has mass 0.450 kg .

Part A

What is the moment of inertia of this rod for an axis at its center, perpendicular to the rod?

Express your answer with the appropriate units.

ANSWER:

I = $1.35\times10^{-2}\ \mathrm{kg\cdot m^2}$

Correct

Part B

One of your engineers has proposed to reduce the moment of inertia by bending the rod at its center into a V-shape, with a 60.0° angle at its vertex. What would be the moment of inertia of this bent rod about an axis perpendicular to the plane of the V at its vertex?

Express your answer with the appropriate units.

ANSWER:

I = $1.35\times10^{-2}\ \mathrm{kg\cdot m^2}$

Correct

Exercise 9.36

A wheel is turning about an axis through its center with constant angular acceleration. Starting from rest, at $t = 0$, the wheel turns through 8.75 revolutions in $t = 10.5\ \mathrm{s}$. At 10.5 s the kinetic energy of the wheel is 38.0 J .

Part A

For an axis through its center, what is the moment of inertia of the wheel?

Express your answer with the appropriate units.

ANSWER:

I = $0.693\ \mathrm{kg\cdot m^2}$

Correct

Exercise 9.53

Part A

Use equation $I = \int r^2\,dm$ to calculate the moment of inertia of a uniform, solid disk with mass M and radius R for an axis perpendicular to the plane of the disk and passing through its center.

Express your answer in terms of the variables M and R.

ANSWER:

$I = \frac{1}{2} R^2 M$

Correct

Score Summary:

Your score on this assignment is 112%.
You received 34.17 out of a possible total of 35 points, plus 5 points of extra credit.