HW7 - due 6 pm Day 15 (Fri. Aug. 15) (6030000)

Question 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

1. Question Details OSColPhys1 10.P.010.WA. [2611572]

With the aid of a string, a gyroscope is accelerated from rest to 36 rad/s in 0.7 s.

(a) What is its angular acceleration in rad/s^2?

[ ] 51.4 rad/s^2

(b) How many revolutions does it go through in the process?

[ ] 2.01 rev

Supporting Materials

Physical Constants

2. Question Details OSColPhys1 10.P.011.WA. [2611841]

A kid is outside his home playing with a metal hoop and stick. He uses the stick to keep the hoop of radius 45.0 cm rotating along the road surface. At one point the hoop coasts downhill and picks up speed.

(a) If the hoop starts from rest at the top of the hill and reaches a linear speed of 9.45 m/s in 11.0 s, what is the angular acceleration of the hoop?

[ ] 1.91 rad/s^2

(b) If the radius of the hoop were larger, how would this affect the angular acceleration of the hoop?

- The angular acceleration would decrease.
- The angular acceleration would increase.
- There would be no change to the angular acceleration.

Supporting Materials

Physical Constants

3. Question Details OSColPhys1 10.P.007.WA. [2632666]

An ultracentrifuge accelerates from rest to 100,000 rpm in 2.20 min.

(a) What is its angular acceleration in rad/s^2?

[ ] 79.3 rad/s^2

(b) What is the tangential acceleration of a point 11.05 cm from the axis of rotation?

[ ] 8.77 m/s^2

(c) What is the radial acceleration of this point at full rpm?

[ ] 1.21e+07 m/s^2

(d) Express this radial acceleration as a multiple of g.

[ ] 1.24e+06 g

Supporting Materials

Physical Constants

4. Question Details OSColPhys1 10.P.004.WA. [2611637]

(a) Calculate the linear acceleration of a car, the 0.240-m radius tires of which have an angular acceleration of 13.5 rad/s^2. Assume no slippage.

[ ] 3.24 m/s^2

(b) How many revolutions do the tires make in 2.50 s if they start from rest?

[ ] 6.71 rev

(c) What is their final angular velocity?

[ ] 33.8 rad/s

(d) What is the final velocity of the car?

[ ] 8.1 m/s

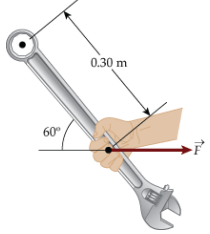
Supporting Materials

Physical Constants

5. Question Details OSColPhys1 9.P.001.WA. [2611468]

A mechanic changing the spark plugs in a car notes that the instruction manual calls for a torque with a magnitude of 16 N · m. If the mechanic grasps the wrench as shown in the figure below, determine the magnitude of the force she must exert on the wrench.

[ ] 61.6 N



Supporting Materials

Physical Constants

6. Question Details OSColPhys1 9.P.002.WA. [2611680]

At the presentation ceremony, a championship bowler is presented a 1.74-kg trophy which he holds at arm's length, a distance of 0.655 m from his shoulder joint.

(a) Determine the torque the trophy exerts about the shoulder joint when his arm is horizontal. (Enter the magnitude only.)

[ ] 11.2 N · m

(b) Determine the torque the trophy exerts about the shoulder joint when his arm is at an angle of 34.0° below the horizontal. (Enter the magnitude only.)

[ ] 9.26 N · m

Supporting Materials

Physical Constants

7. Question Details OSColPhys1 9.P.009.WA. [2611506]

Two children playing on a frictionless garden gate invent a new game called "gate". The idea is that they will get on opposite sides of the gate and each push such that the gate does not move. If they both push horizontally and perpendicular to the gate and one child pushes with a force of 140 N at a distance of 0.580 m from the hinges, determine the force the second child must exert in order to keep the gate from moving if she pushes at a distance of 0.300 m from the hinges.

[ ] 271 N

Supporting Materials

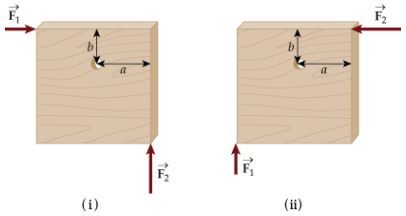
Physical Constants

8. Question Details OSColPhys1 9.P.004.WA. [2611735]

As shown in the figure below, we have a square one meter on a side that is free to rotate about an axis perpendicular to the plane of the square, a distance a from one side and a distance b from the other side. Two forces, $\vec{F}_1$ and $\vec{F}_2$, are applied to diagonally opposite corners, and act along the sides of the square, first as shown in case (i) and then as shown in case (ii) of the drawing. In each case the net torque produced by the forces is zero. If the magnitude of $\vec{F}_2$ is 6 times that of $\vec{F}_1$, find the distances a and b that locate the axis. It should be noted that a and b are not drawn to scale.

a = [ ] 0.027 m

b = [ ] 0.162 m



Supporting Materials

Physical Constants

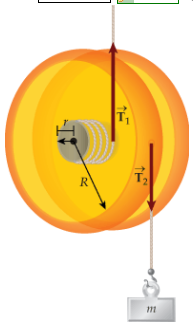
9. Question Details OSColPhys1 9.P.031.WA. [2632696]

A yo-yo of mass M = 0.165 kg and outer radius R that is 2.00 times greater than the radius of its axle r is in equilibrium if a mass m is suspended from its outer edge as shown in the figure below. Determine the tension in the two strings, T_1 and T_2 and the mass m.

T_1 = [ ] 3.23 N

T_2 = [ ] 1.62 N

m = [ ] 0.165 kg

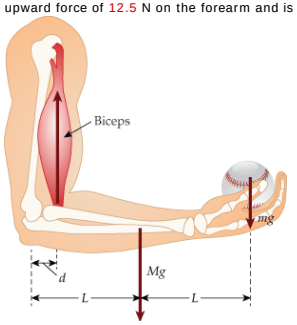


Supporting Materials

Physical Constants

10. Question Details OSColPhys1 9.P.041.WA. [2611849]

You hold a 1.80-N softball in your hand as shown in the figure. Consider your forearm and hand to be a uniform rod with a mass of 1.80 kg and the distance between the elbow joint and the ball in your hand is $2L$ = 27.0 cm. Your biceps exerts an upward force of 12.5 N on the forearm and is attached at a distance of d = 4.00 cm from the elbow.



(a) Using the elbow joint as the axis of rotation, determine the magnitude of the net torque acting about the elbow due to the forearm, hand, and ball.

2.37 N · m

(b) In which direction will the forearm and hand rotate, if the net torque obtained in part (a) is nonzero?

- no rotation
- clockwise
- counterclockwise

Supporting Materials

Physical Constants

11. Question Details OSColPhys1 10.P.015.WA. [2611729]

A soccer player extends her lower leg in a kicking motion by exerting a force with the muscle above the knee in the front of her leg. She produces an angular acceleration of 26.5 rad/s^2 and her lower leg has a moment of inertia of 0.750 kg · m^2. What is the force exerted by the muscle if its effective perpendicular lever arm is 3.50 cm?

568 N

Supporting Materials

Physical Constants

12. Question Details OSColPhys1 10.P.021.WA. [2611768]

During a testing process, a worker in a factory mounts a bicycle wheel on a stationary stand and applies a tangential resistive force of 120 N to the tire's rim. The mass of the wheel is 1.40 kg and, for the purpose of this problem assume that all of this mass is concentrated on the outside radius of the wheel. The diameter of the wheel is 55.0 cm. A chain passes over a sprocket that has a diameter of 8.50 cm. In order for the wheel to have an angular acceleration of 4.50 rad/s^2, what force must be applied to the chain? (Enter the magnitude only.)

788 N

Supporting Materials

Physical Constants

13. Question Details OSColPhys1 10.P.024.WA. [2611485]

A force of 30 N is applied tangentially to the rim of a solid disk of radius 0.20 m. The disk rotates about an axis through its center and perpendicular to its face with a constant angular acceleration of 125 rad/s^2. Determine the mass of the disk.

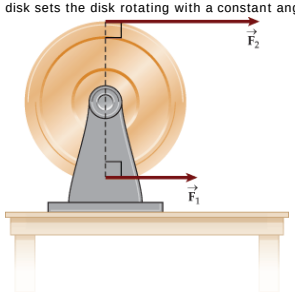
2.4 kg

Supporting Materials

Physical Constants

14. Question Details OSColPhys1 10.P.027.WA. [2611642]

A uniform solid disk is mounted on an axle in such a way that it is free to rotate about a horizontal axis. The radius of the disk is 0.450 m and its mass is 24.5 kg. As shown in the diagram, two forces F_1 = 84.0 N and F_2 = 140 N applied to the disk sets the disk rotating with a constant angular acceleration. Assume the axle is frictionless.



(a) Calculate the magnitude and direction of the net torque produced by the two forces.

magnitude 25.2 N · m

direction ---Select--- clockwise

(b) Determine the magnitude of the angular acceleration of the disk.

10.2 rad/s^2

Supporting Materials

Physical Constants

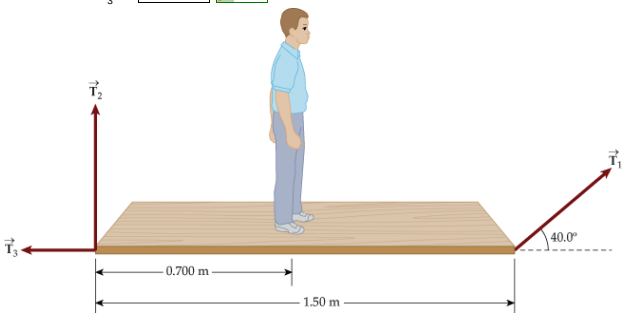
15. Question Details OSColPhys1 9.P.025.WA. [2611501]

A person is standing on a section of uniform scaffolding as shown in the figure. The section of scaffolding is L = 1.50 m in length, has a m_s = 32.0 kg mass and is supported by three ropes as shown. Determine the magnitude of the tension in each rope when a person with a weight of W_p = 660 N is a distance d = 0.700 m from the left end.

magnitude of $\vec{T}_1$ [ ] 723 N

magnitude of $\vec{T}_2$ [ ] 509 N

magnitude of $\vec{T}_3$ [ ] 554 N



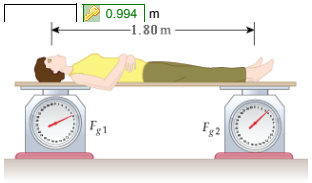
Supporting Materials

Physical Constants

16. Question Details OSColPhys1 9.P.033.WA. [2611555]

The center of mass of a person may be determined by an arrangement such as the one shown in the figure below. A light plank rests on two scales separated by a distance of d = 1.80 m and reading F_{g1} = 475 N and F_{g2} = 385 N. Determine the distance of the girl's center of mass from her feet.

[ ] 0.994 m



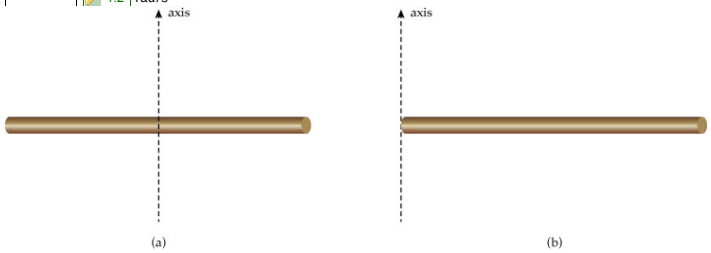
Supporting Materials

Physical Constants

17. Question Details OSColPhys1 10.P.025.WA. [2611736]

A torque is applied to a long thin rod making it rotate with an angular acceleration of 4.80 rad/s^2 about an axis through its center and perpendicular to its length (see the Figure (a) below). If the same torque is now applied to make the rod rotate about an axis about one end perpendicular to its length (see Figure (b) below), determine the new angular acceleration of the rod.

[ ] 1.2 rad/s^2



Supporting Materials

Physical Constants

18. Question Details OSColPhys1 10.P.020.WA. [2611616]

A solid cylinder is mounted above the ground with its axis of rotation oriented horizontally. A rope is wound around the cylinder and its free end is attached to a block of mass 91.5 kg that rests on a platform. The cylinder has a mass of 205 kg and a radius of 0.330 m. Assume that the cylinder can rotate about its axis without any friction and the rope is of negligible mass. The platform is suddenly removed from under the block. The block falls down toward the ground and as it does so, it causes the rope to unwind and the cylinder to rotate.

(a) What is the angular acceleration of the cylinder?

[ ] 14 rad/s^2

(b) How many revolutions does the cylinder make in 5 s?

[ ] 27.9 rev

(c) How much of the rope unwinds in this time interval?

[ ] 57.8 m

Supporting Materials

Physical Constants

Assignment Details

Name (AID): **HW7 - due 6 pm Day 15 (Fri. Aug. 15) (6030000)**
Submissions Allowed: **5**
Category: **Homework**
Code:
Locked: **No**
Author: **Chowdary, Krishna** (chowdark@evergreen.edu)
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