Rotation Homework Problems:
p. 91: #2, 7, 9, 12, 13, 15

Problems taken from the school's old textbook:

Giancoli, D. (1980). *Physics*, 2nd Ed. Englewood Cliffs, NJ: Prentice Hall.

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2. A jet plane traveling 1800 km/h (500 m/s) pulls out of a dive by moving in a circle arc of radius 3.00 km. What is the plane's acceleration in *g*'s? (One "*g*" is 9.8 m/s^2, the acceleration we normally experience at the surface of home-sweet-home – earth).

7. Jack Sparrow plans to cross a gorge by swinging in an arc from a hanging vine. If his arms are capable of exerting a force of 1500 N on the rope, what is the maximum speed he can tolerate at the lowest point of his swing? His mass is 85 kg; the vine is 4.0 m long.

9. A coin is placed 18.0 cm from the axis of a rotating turntable of variable speed. When the speed of the turntable is slowly increased, the coin remains fixed on the turntable until a rate of 58 rpm (rotations-per-minute) is reached, at which point the coin slides off. What is the coefficient of static friction between the coin and the turntable?

12. What minimum speed must a roller coaster travel at when upside down at the top of a loop-de-loop on the track if the passengers are not to fall out? Assume a radius of curvature of 8.0 m. (And yes, assume these passengers not only have learned their physics but are entrusting their lives to it!! They are NOT wearing any seatbelts!)
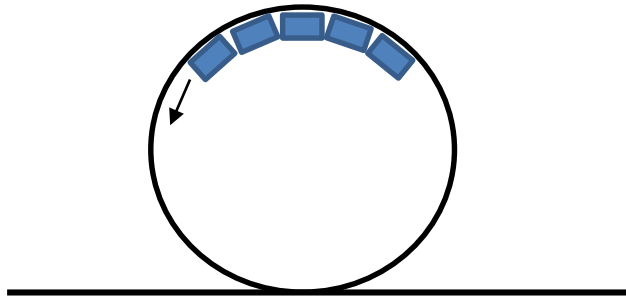
13. A ball on the end of a string is revolving at a uniform rate in a vertical circle of radius 96.5 cm as shown. If its speed is 3.15 m/s and its mass is 0.335 kg, calculate the tension in the string when the ball is
   a)   at the top of its path.
   b)   at the bottom of its path.
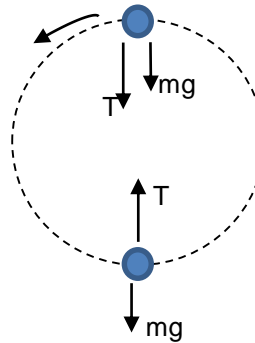
15. A projected space station consists of a circular tube having a diameter of 1.6 km which is set rotating about its center (like a tubular bicycle tire, or a giant hollow donut).
   a)   On which part of the inside of the tube (the side closest to or furthest from the center) will people be able to walk?
   b)   What must be the rotation speed (in revolutions per day) if an effect equal to gravity at the surface of the earth (1 *g*) is to be felt? (Hint: When you are just standing on the ground here on earth, what is the size of the force that pushes up on you from the ground?)

ANSWERS:
   2. 8.5 *g*'s
   7. 5.6 m/s
   9. 0.674
   12. 8.85 m/s
   13a. 0.162 N
   13b. 6.73 N

15a. People would walk on the surface of the tube farthest from the center of rotation.
15b. 1521.89 rev/day