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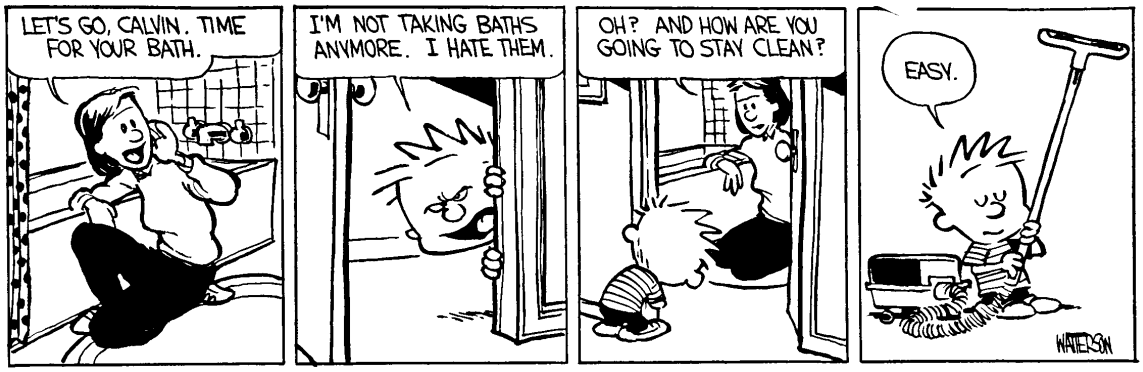
AP Physics – Centripetal Force – 32

Name _____Per___



I am a marvelous housekeeper. Every time I leave a man I keep his house. -- Zsa Zsa Gabor

1. A compact disc is designed to be read at a constant linear speed of 1.3 m/s. Find the angular speed of the disc when the reading laser is (a) 5.0 cm and (b) 8.0 cm from the center of the disc.

(c) What does the motor have to do as the reading laser moves further and further out from the center?

2. A test car moves at a constant speed of 10. m/s around a circular road of radius 50. m. Find the car's (a) centripetal acceleration and (b) angular speed.

3. Find the centripetal acceleration at a point on the equator (radius at the equator of 6378 km) of Earth.

4. A car starts from rest on a circular racetrack of radius 400. m. At the point where the centripetal and tangential accelerations are 0.500 m/s^2 determine (a) the speed of the car (b) the distance traveled and (c) the elapsed time.

5. A disc rotates clockwise about its axis. What is the direction of the angular momentum vector? Draw a picture of how you determined this.

6. A 1.2 kg stone is attached to a 1.3 m line and swung in a circle. If it has a tangential speed of 13 m/s, what is the centripetal force?

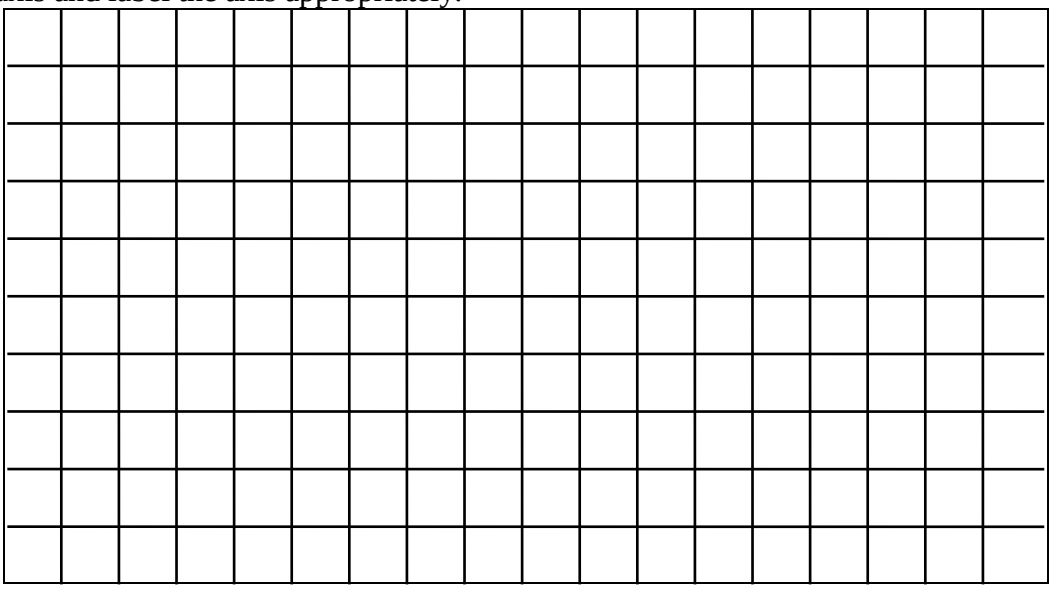
7. A car has a constant speed of 15.0 m/s and makes a turn of radius 50.0 m. Find the minimum coefficient of friction.

8. A student designs an experiment in which a mass attached to a one-meter-long string is wrapped around a pulley which has a 0.1 m radius. The pulley includes a sensor which measures and records its rotational velocity. The mass is dropped from rest and the final rotational velocity of the pulley as well as the time the mass is in the air is measured. Data is shown in the table below.

m (kg)	ω_f (rad/s)	time (s)	α (rad/s^2)
0.2	24	0.84	
0.4	30	0.68	
0.6	33	0.61	
0.8	35	0.58	
1.0	36	0.55	

(a) Complete the table above by calculating the angular acceleration for each of the hanging masses.

(b) Plot the angular acceleration vs. the hanging mass. Make sure to place variables on the correct axis and label the axis appropriately.



(c) Using your plot, estimate the angular acceleration of the pulley for a hanging mass of 500 g.

(d) Determine the time it will take for a 500 g mass attached to the 1.0 meter string to fall all the way through the pulley which has a 0.1 m radius.