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## PHYS 1210 Discussion Worksheet 3 Newton's First Law

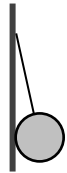
### Summary

#### *Newton's first law*

$$\Sigma \vec{F} = 0 \Leftrightarrow \vec{a} = 0$$

### Problems

There is not room on this worksheet for your work. Use your own scratch paper!

1. A spherical tetherball of mass  $m$  and radius  $r$  hangs against a pole, partly supported by a massless cord of length  $L$  attached to the same pole. The coefficient of static friction between the ball and the pole is  $\mu_s$ .
  - a. Draw a free-body diagram for the ball.
  - b. Determine the magnitude and direction of the normal force between the ball and the pole and of the tension in the cord.
  - c. The ball has a mass of 1.20 kg, a radius of 16.0 cm, and hangs from a light cord 1.15 m long. Find
    - i. The angle between the cord and the pole
    - ii. The normal force between the pole and the ball
    - iii. The tension in the cord
  - d. What happens to the normal and tension forces when  $r \gg L$ ? Does this make sense?
  
2. The late Aricebo radio telescope comprised a fixed circular reflector with an 820-tonne (1 tonne = 1000 kg) instrument cluster suspended above it by three bundles of six cables each anchored in an equilateral triangle\*. I haven't been able to find exact specifications for the instrument, but it appears that the triangle was inscribed in a circle with a radius of about 200 meters. The cables made an angle of about 5 degrees below horizontal. What was the tension in one of the 18 suspension cables if the load was shared equally between all of them?