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 μ_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?