Rotation Problems II

1. A bug is sitting on a spinning record that is rotating at a constant 33 1/3 rpm. The bug is 15 cm from the center of the record.
   a. What is the linear speed of the bug?

   b. What is the centripetal acceleration of the bug?

   c. If the bug crawls to a radius of only 5 cm, what is the new centripetal acceleration?

2. Unlike a record, a CD does not spin with a constant angular speed. Assume a CD player operates such that the laser reading the CD is traveling with a constant linear speed of 15 m/s.
   a. If the laser is tracking on the inside radius of 1.5 cm, what is the angular speed of the CD?

   b. If the laser is tracking on the outside radius of 5.5 cm, what is the angular speed of the CD?

3. Starting from rest, a car goes around a curve of constant radius with a constant tangential acceleration of 2 m/s^2 and a constant angular acceleration of 0.08 rad/s^2.
   a. What is the radius of the curve?

   b. How many seconds will it take to reach a centripetal acceleration of 5 m/s^2?

4. A pendulum is made of a mass at the end of a 2.5 m string. The pendulum is pulled back 30° from vertical and released.
   a. What is the initial angular acceleration of the pendulum?

   b. What is the angular acceleration of the pendulum at its lowest point?

   c. What is the angular speed of the pendulum at its lowest point?

Answers: *1. a) 0.52 m/s b) 1.8 m/s^2 c) 0.6 m/s^2 2. a) 1000 rad/s b) 273 rad/s*
3. a) 25 m b) 5.6 s 4. a) 2 rad/s^2 b) 0 rad/s^2 c) 1 rad/s