Name: _____ Date:_____

Mr. Croom's Physics Chapter 7: Rotational motion

Total Acceleration

Solve the following problems

1. (Walker, p. 301, #29) Jeff of the Jungle swings on a vine that is 7.20 m long. At the bottom of the swing, just before hitting the tree, Jeff's linear speed is 8.50 m/s. **(a)** Find Jeff's angular speed at this time. **(b)** What centripetal acceleration does Jeff experience at the bottom of his swing? **(c)** What exerts the force that is responsible for Jeff's centripetal acceleration?

2. (Walker, p. 301, #30) Suppose, in previouse problem, that at some point in his swing Jeff of the Jungle has an angular speed of 0.850 rad/s and an angular acceleration of $0.620\ \text{rad}/\text{s}^2$. Find the magnitude of his centripetal, tangential, and total accelerations, and the angle his total acceleration makes with respect to the tangential direction of motion.

3. (Walker, p. 302, #31) A compact disk, which has a diameter of 12.0 cm, speeds up uniformly from zero to 4.00 rev/s in 3.00 s. What is the tangential acceleration of a point on the outer rim of the disk at the moment when its angular speed is **(a)** 2.00 rev/s and **(b)** 3.00 rev/s?

4. (Walker, p. 302, #32) When a compact disk with a 12.0-cm diameter is rotating at 5.25 rad/s, what is **(a)** the linear speed and **(b)** the centripetal acceleration of a point on its outer rim? **(c)** Consider a point on the CD that is halfway between its center and its outer rim. Without repeating all of the calculations required for parts (a) and (b), determine the linear speed and the centripetal acceleration of this point.

5. (Walker, p. 302, #37) To polish a filling, a dentist attaches a sanding disk with a radius of 3.20 mm to the drill. **(a)** When the drill is operated at 2.15×10^4 rad / s, what is the tangential speed of the rim of the disk? **(b)** What period of rotation must the disk have if the tangential speed of its rim is to be 275 m/s?

6. (Walker, p. 302, #38) In the previous problem, suppose the disk has an angular acceleration of 232 rad/s^2 when its angular speed is 640 rad/s. Find both the tangential and centripetal acceleration of a point on the rim of the disk.

7. (Walker, p. 302, #39) The Bohr model of the hydrogen atom pictures the electron as a tiny particle moving in a circular orbit about a stationary proton. In the lowest-energy orbit the distance from the proton to the electron is 5.29×10^{-11} m, and the linear speed of the electron is 2.18×10^6 m / s. **(a)** What is the angular velocity of the electron? **(b)** How many orbits about the proton does it make each second? **(c)** What is the electron's centripetal acceleration?

8. (Walker, p. 302, #34 & 35) A Ferris wheel with a radius of 9.5 m rotates at a constant rate, completing one revolution every 32 s. Find the direction and magnitude of a passenger's acceleration when **(a)** at the top and **(b)** at the bottom of the wheel.**(c)**Suppose the Ferris wheel begins to decelerate at the rate of 0.22 rad/s^2 when the passenger is at the top of the wheel. Find the direction and magnitude of the passenger's acceleration at that time.