Rotation 1

1. Angular motion has many similarities to linear motion. Instead of position s, there is angular position θ. Instead of velocity v, there is angular velocity ω. Instead of acceleration a, there is angular acceleration α. Write the kinematic equations for angular quantities below.

2. Angular position, angular speed, and angular acceleration can be converted to linear quantities if the radius is known. Write the conversions from angular position, velocity, and acceleration to their linear counterpart below using r for the radius.

3. A record turntable spins at 45 rpm. What is its angular speed in radians/sec? Show all work.

4. The turntable is switched off and the time to stop rotating is measured. What is α ? Show all work.

5. The turntable now rotates at 33.3 rpm. Predict the time for it to stop rotating assuming α is the same as that found in (4). (don't forget to convert rpm to radians/sec) Show all work.

6. Predict the change in angle for a point on the turntable if it is switched off while rotating at 45 rpm. There are 2 ways to do this, one uses the time measured in (4), the other method does not. Use both methods and show your work below.

7. The needle on the record has a linear or tangential speed relative to the record. When it is playing the first (outside) track at a radius of 0.14 m and 33.3 rpm, what is its linear speed? What is its linear speed on the last track at a radius of 0.07 m? When the turntable is switched off on the last track, what is the linear acceleration? Use your results from (4) and (5). Show all work.

8. A turntable is switched from 45 rpm to 33.3 rpm. It takes 1.6 sec to change speed. What is the change in angle of a point on the turntable in this 1.6 sec? (assume constant α) Show all work. Use results from (3) and (5).