PH201 Reading Week 6
Chapter 7: Rotational Motion

We will reduce this chapter entirely to the questions of the workbook. Work through these question using your text. Most of the questions can be answered without reading the textbook, but relying of the work we did at circular motion. I will post some new equations below, because some of you like equations. When you work through the workbook, you will realize that you do not need these equations to solve many (most of the presented) problems.

An extended rigid body will not change its angular motion unless a net torque is acting on it. The net torque is for rotational motion what the net force is for linear motion. The moment of inertial I, is for rotational motion what the mass is for linear motion. And finally the angular acceleration α if for rotational motion what the acceleration a is for linear motion.

Newton's second law for linear motion: $$a = \frac{F_{net}}{m}$$

Newtons second law for rotational motion: $$\alpha = \frac{\tau_{net}}{I}$$

with α= angular acceleration, τ = torque, I = moment of Inertia. More about the moment of Inertia I in chapter 7.5, the workbook questions are enough for PH201.

The angular velocity ω in uniform circular motion: $$\omega = \frac{\text{angular displacement}}{\text{time interval}} = \frac{\Delta\theta}{\Delta t} \quad (7.3)$$

That allows us the relate to initial and final angular position: $$\theta_f - \theta_i = \Delta\theta = \omega\,\Delta t \quad (7.4)$$

Speed and angular speed are related through: $$v = \omega r \quad (7.7)$$

Angular acceleration is defined as: $$\alpha = \frac{\text{change in angular velocity}}{\text{time interval}} = \frac{\Delta\omega}{\Delta t} \quad (7.8)$$

Tangential acceleration is related to rotational acceleration: $$a_t = \alpha r \quad (7.9)$$

Torque can be calculated from: $$\boldsymbol{\tau = r * F_{\perp =} = r * sin\theta * F} \quad (7.10)$$
That means you can calculate the torque by multiplying the length of the arm a force is acting on with the part of the force that is perpendicular (⊥) to the arm.

Student Learning Objectives

In covering the material of this chapter, students will learn to

- Describe rotating objects in terms of angle, angular velocity, and angular acceleration.
- Understand the connection between concepts and equations of linear motion and angular motion.
- Compute torque for forces applied to extended objects.
- Understand the concepts of center of gravity and moment of inertia.
- Solve workbook problems involving rotation about a fixed axis.
- Understand rolling motion.

Some questions that successful students can answer after reading the text

All questions for this chapter will be reduced to the workbook.
You can skip questions 21, 26, 27, 28, 31