

Physics 422/820 – Fall 2016

Homework #9, Due at beginning of class Monday Nov 7

1. [10 pts] A carousel (a fancy merry-go-round) begins to rotate at time $t = 0$. Its angular velocity of rotation is given by

$$\Omega = \frac{\omega_0 t}{t + t_0}$$

where ω_0 and t_0 are constants. A person of mass M is sitting on one of the carved wooden horses, at a distance R from the center of the rotating platform.

- (a) Find the component of force on the person in the radial direction as a function of time by using Newton's laws in the inertial (non-rotating) frame.
 - (b) Find the component of force on the person in the tangential direction as a function of time by using Newton's laws in the inertial (non-rotating) frame.
2. [10 pts] Repeat problem 1 but this time work in the rest frame of the rotating carousel, using the inertial forces derived in class:

$$\mathbf{F}_{\text{eff}} = \mathbf{F} - \mathbf{M}\dot{\boldsymbol{\omega}} \times \mathbf{r} - \mathbf{M}\boldsymbol{\omega} \times (\boldsymbol{\omega} \times \mathbf{r}) - 2\mathbf{M}\boldsymbol{\omega} \times \dot{\mathbf{r}}$$