PHYSICS 121 WORKSHEET 13 11/1/2017

NAME: SECTION:

1. Write down the equations of motion for a rotating object. Write down the definitions of torque, angular velocity, angular acceleration, and angular kinetic energy.

2. A carousel is initially at rest and begins rotating with angular acceleration $\alpha = 2rad/s^2$. After 10 seconds have passed, determine:

i) The angle θ through which it has rotated.

ii) The angular velocity ω.

iii) The velocity of a child located $5m$ from its center.

iv) The rotational kinetic energy if the carousel has moment of inertia $I = 30kgm^2$.

3. The carousel from **2** begins to decelerate at a rate of $\alpha = -1 rad/s^2$ after the initial 10 seconds have passed.

i) How long does it take to stop rotating?

ii) How long does it take to stop rotating if the child sitting $5m$ from the center drags his feet, applying a friction force of $20N$?

4. A force $\boldsymbol{F} = 1\hat{\boldsymbol{x}} + 1\hat{\boldsymbol{y}}$ is applied to the point $\boldsymbol{r} = 1\hat{\boldsymbol{x}} + 1\hat{\boldsymbol{y}} + 1\hat{\boldsymbol{z}}$. What is the net torque?