Problem Set #10 Circular Motion
Due Friday January 25th

Name:_____

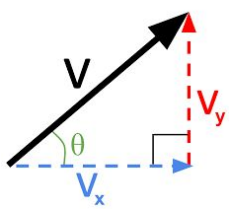
I worked with:

Equations:

Translational

Displacement:	$x(t) = x_0 + v_0t + ½ at^2$
Velocity:	$v(t) = v_0 + at$
Velocity (ang velocity):	$v = \omega/r$
Final Velocity (time):	$v_f = v_0 + at_f$
Final Velocity (displacement):	$v_f^2 = v_0^2 + 2ax_f$
Force:	$F = ma$
Acceleration due to gravity:	$9.8\ m/s^2$
Momentum:	$p = mv$
Impulse:	$F(t_2 - t_1) = m(v_2 - v_1)$
Kinetic Energy:	$KE = ½mv^2$
Gravitational Potential Energy:	$PE = mgh$

Use a right triangle and sine and cosine to Calculate V_x and V_y



Rotatational

Angular Displacement:	$\boldsymbol{\theta}(t) = \boldsymbol{\theta}_0 + \omega_0t + ½ \boldsymbol{\alpha}t^2$
Angular Velocity:	$\boldsymbol{\omega}(t) = \boldsymbol{\omega}_0 + \boldsymbol{\alpha}t$
Angular Velocity (time):	$\boldsymbol{\omega}_f = \boldsymbol{\omega}_0 + \boldsymbol{\alpha}t_f$
Angular Velocity (displacement):	$\boldsymbol{\omega}_f^2 = \boldsymbol{\omega}_0^2 + 2\boldsymbol{\alpha\theta}_f$
Angular Velocity (trans. velocity):	$\boldsymbol{\omega} = rv$
Centripetal Acceleration:	$a_c = v^2/r$
Centripetal Force:	$F = ma_c = mv^2/r$
Torque:	$\boldsymbol{\tau} = I\boldsymbol{\alpha}$
Kinetic Energy:	$KE = ½I\boldsymbol{\omega}^2$

1. Elmira, New York boasts of having the fastest carousel ride in the world. The merry-go-round at Eldridge Park takes riders on a spin at 18 mi/hr (8.0 m/s). The radius of the circle about which the outside riders move is approximately 7.4 m.

   a. Determine the time for outside riders to make one complete circle.

   b. Determine the acceleration of the riders.

2. Sheila (m=62 kg) is riding the Demon roller coaster ride. The turning radius of the top of the loop is 12 m. Sheila is upside down at the top of the loop and experiencing a normal force which is one-half of her weight. Draw a free body diagram and determine Sheila's speed.

3. (Honors) Mr. Caroline does a demonstration with a bucket of water tied to a 1.3-meter long string. The bucket and water have a mass of 1.8 kg. Mr. H whirls the bucket in a vertical circle such that it has a speed of 3.9 m/s at the top of the loop and 6.4 m/s at the bottom of the loop.

   a. Determine the acceleration of the bucket at each location.

   b. Determine the net force experienced by the bucket at each location.

   c. Draw a free body diagram for the bucket for each location and determine the tension force in the string for the two locations.