Classical Mechanics
Discussion Problem
Problem 2

A grandfather clock is on a ship crossing the Atlantic. The key aspect of the clock's timing system is a pendulum attached to a support. Due to the ship's motion, the support moves with an acceleration, $A(t)$.

1. Find the acceleration of the pendulum in polar coordinates, using the support as the origin of your noninertial reference frame.
2. Considering only motion in the plane of the pendulum's movement, find the equation of motion for the angle of the pendulum in terms of $A_x$ and $A_y$, the acceleration of the ship (and thus, the pendulum support) in the horizontal and vertical directions.
3. Check that your equation reduces to the proper form if $A_x = 0$ and $A_y = -g$. 

![Diagram of a pendulum with acceleration vectors]