Spring 2025

PHY-110

Name and Group Members: \_\_\_\_

## Lab 3: Flying Pigs

Goal:

Analyze an object moving in uniform circular motion. Devise an experiment to predict the **period** (*time to complete one revolution*) from measurable parameters of the motion. Test the prediction by comparing the theoretical value of the period to the experimental one.

 $\checkmark$  Note the pig's motion. What kind of motion is this?

 $\checkmark$  Of the parameters shown in the figure below, which do you think are measurable?



 $\checkmark$  What parameters must be calculated from the measurables?

Theoretical Analysis:

Rewrite the expression of the period that you derived in the lecture in terms of the measurable quantities.

## Experimental procedure:

Examine the experimental set up: A plastic pig with wings is connected to a length of string from a magnetic hook which is attached to the ceiling.

Start the experiment: Open the pig's wings (so that it clicks into place) and turn on the switch on the pig's side, and watch it fly!

Give the pig a sideways initial velocity so that you set it into circular motion. Practice that a few times to get a near-perfect circular motion.

✓ Using the available equipment, measure the time it takes the pig to complete one revolution. \*\*\*Remember that only one measurement won't be very accurate...

 $\checkmark$  Measure other parameters of the motion, as you see fit.

## Data Analysis:

✓ In an Excel Spreadsheet, record your measured values of the period. Calculate the average value of the period *T* as well as the uncertainty  $\delta T$ . This will give you the **experimental** value of the period.

✓ Plug your measured parameters in the theoretical equation previously derived. What is the **theoretical (predicted) period** of the motion? Determine the uncertainty in your predicted value using an appropriate error propagation equation.

 $\checkmark$  Compare your "theoretical value" of the period to your measured (experimental) value. Do they agree within the uncertainty?

 $\checkmark$  Calculate the values of the following quantities as well (no uncertainty is required):

- frequency f of the motion (recall that f = 1/T),
- speed *v* of the pig,
- acceleration of the pig,
- tension in the string.

If there is a significant disagreement, re-examine your theory. See if you can reconcile the results and your theoretical model. You may also confer with other lab groups and see if their data leads to a calculated period that agrees with their measured value.