Use the Direct Solution Format for all problems on this assignment. Your solution to problems 1 and 2 should be the direct printout of spreadsheet pages. Each page should have

- Your name, the course, the due date, homework number, and a title for the assignment. This header information can fit on one or two lines
- An area with clearly labeled constants or problem parameters
- Tabular data that is labeled with meaningful titles, and with numerical values having an appropriate number of digits
- Plots – no more than one per page – with properly labeled axes (with units) and legible font sizes.

Print the spreadsheet pages file and include it with any other sheets of paper you submit as part of your assignment. Do not email the document to your instructor.

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1. Use your mobile robot to complete the following tasks. The power to the robot should be from a USB cable connected to your computer. If your computer is a laptop, it would be best if you kept the laptop plugged into a wall outlet.

   a. Collect three sets of calibration data *for each wheel* of the robot. You can use the **wheel_calibration.ino** sketch or the **wheel_calibration_array.ino** sketch to drive the motors. For each trial column, record the number of rotations of one of the wheels in the table. The following table shows an example layout of a data sheet to store your answer. Be sure to record the motor (A or B), the length of the measurements, and the power source (USB or battery pack).

   Motor: _____   Trial length: _____ seconds   Power Source: _____

PWM	Trial 1	Trial 2	Trial 3	Omega (rad/s)
0				
55				
105				
155				
2-5				
255				

b. At each PWM setting, compute the average, for the three trials, of the rotation rate of the wheel (rad/s).

c. Plot of PMW (on the vertical axis) versus Omega (rad/s) on the horizontal axis. Use the Excel scatter plot, not a line plot. Do not connect the data with lines or curves. In other words, the raw data should just appear as symbols the plot.

d. Add a trendline to the plot and report (on your solution sheet) the equation of the curve you selected. Note that a second order polynomial might be a slight improvement over a line fit, but do not use higher than a quadratic.

Note that you will need to do the calibration for each wheel. Therefore, steps (a) through (d) will need to be repeated for both the A and B drives.

2. Repeat problem 1 using a battery pack with 4AA batteries, or one 9V battery as the power supply. Do not connect the USB cable from your computer to the Arduino, while a battery pack or other DC power supply is connected to the Arduino board.