"Robot Acceleration"

1) Acceleration is calculated by which of the following?  
   - Force  
   - mass  
   - distance time  
   - torque amps

2) Given the information in Question 1, assume you have a wheel of known size, and a torque is applied to the wheel, which is attached to a robot, resting on the ground. How do we convert this torque to linear force? (use metric units)

3) Given the information in Question 2, assume the robot has a given mass. (Not to be confused with weight) Substitute the equation in Question 2 to obtain acceleration as a function of torque, wheel size, and mass.

4) Given a constant torque of 1.53 Newton meters, a mass of 5 kg, a wheel size of 0.102 meters fast would the robot accelerate?

5) Realizing that motors DO NOT produce constant torque, what happens to the acceleration as the robot speeds up?

6) What do we call it when our acceleration decreases to 0, after accelerating for a while?

7) What do we call it when a motor’s torque drops to 0, at a certain rpm? How is this related to Question 6?

8) When does a motor draw the most current? What is this called?

9) When does a motor draw the least current? What is this called?

10) A battery is connected to the robot, and it accelerates as fast as it can, until it reaches top speed. 1 second later, when is the battery voltage the highest?

11) When is it the lowest?

12) What happens to the battery voltage as the robot begins to move?

13) How does this change in voltage affect acceleration? Top speed?

14) Assume the same battery’s charge is depleted. Charged it read 8.4V. Now it reads 7.2V. How do acceleration, top speed, & current draw change?