Adam Maher

Bailey Popp

Matthew Teweleit

Phase 1

**Question 1:**

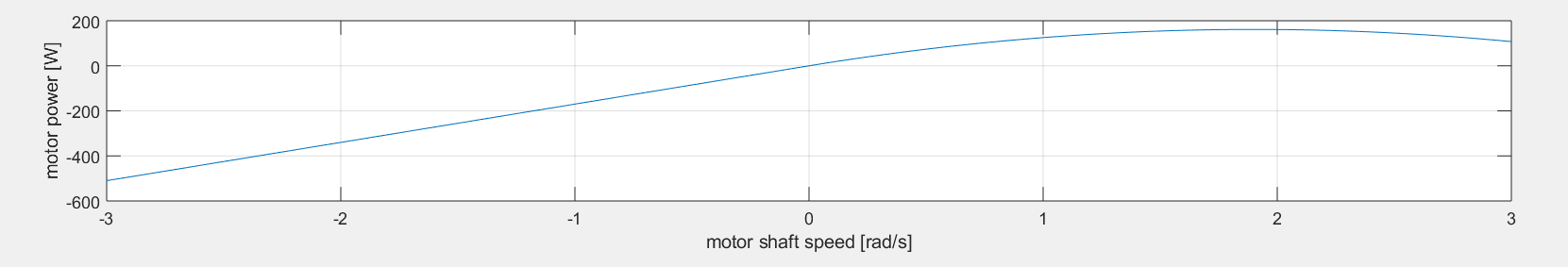
The major advantage to having the gravity constant placed into a struct which is then passed into multiple functions, is that if the gravity constant needed to be changed it would only have to be changed in one place. For instance, if we were going to run these scripts and functions as if rover were on earth, we would only have to change the 3.72 to a 9.81 in the structure. The new value would immediately replace the old value when the field is called within a script or function. This is the most convenient way to define and use the gravitational constant within the codes used for the rover, so we would not have done that any differently.

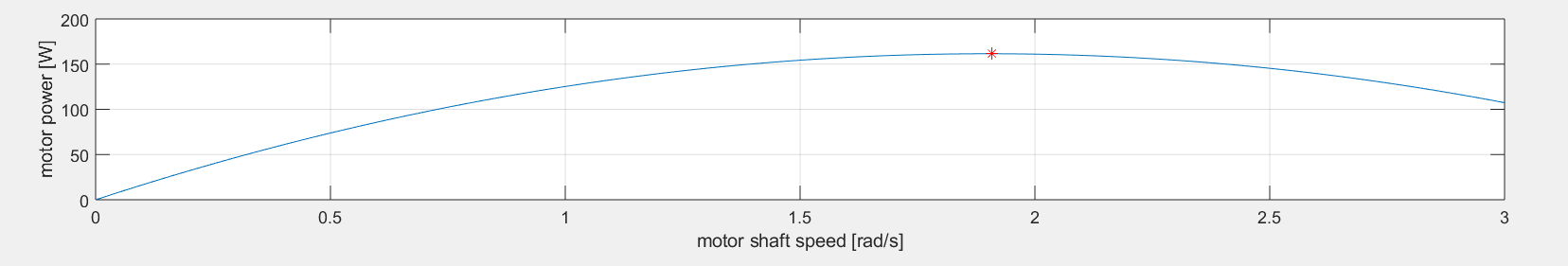
**Question 2:**

If we call F\_gravity using a terrain slope of 110 degrees, an error occurs. The error reads “All values of terrain\_angle must be between -75 and +75 degrees.” The error occurring is desirable behavior because the terrain slope is greater than 75 degrees, and our code was written intending to display an error if that slope angle is not in between -75 and 75 degrees.

**Question 3:**

As omega approaches negative infinity, the power increases at a linear rate. However, this is not physically true, so we are going to rely on positive values of omega to determine the maximum power. The maximum power is 161.4963 which occurs at a motor shaft speed of 1.9091 radians/second.

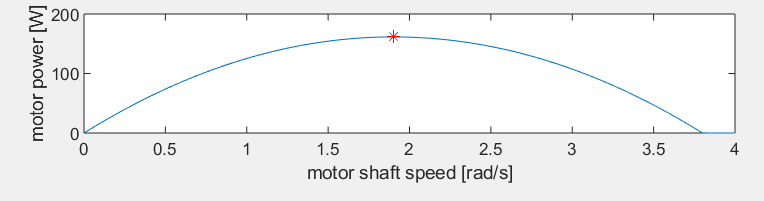




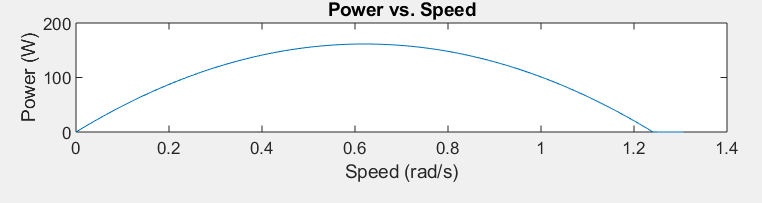
**Question 4:**

The power output of the drive system in the motor and the speed reducer are the same. The power for the motor and the speed reducer are calculated using the same equation of because the gear ratio in the speed reducer equation cancels out. This can be seen in the graphs below, the only difference is seen on the x-axis as the motor is plotted using omega values and the speed reducer is plotted using omega-out values.

**Figure 1:** Power vs Speed Graph of Motor



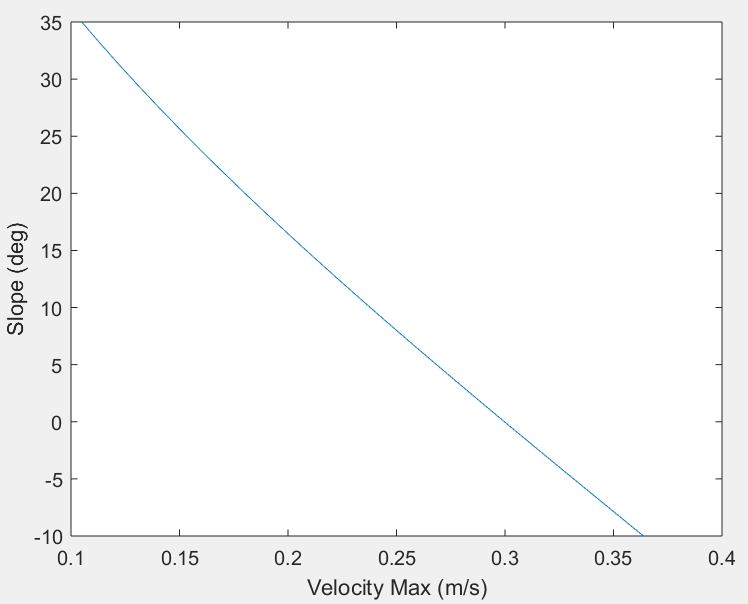
**Figure 2:** Power vs Speed Graph of Speed Reducer



**Question 5:**

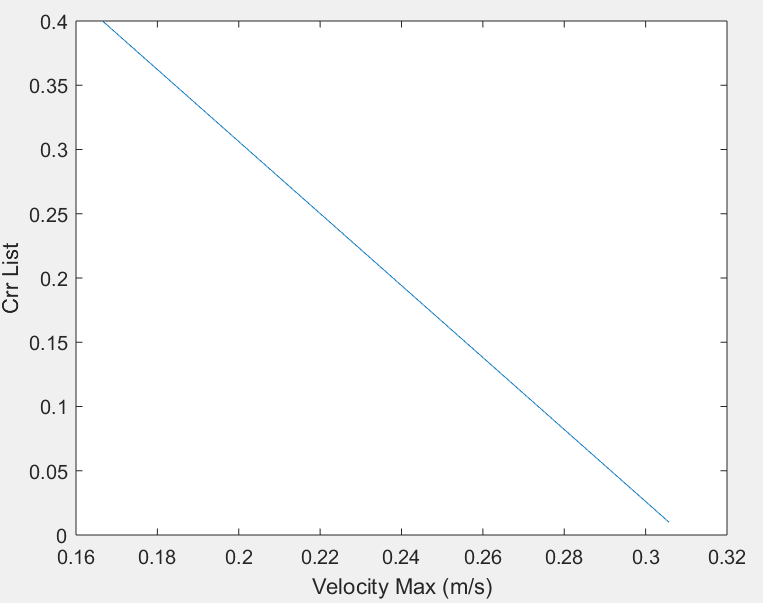
According to *Figure 3* the slope decreases at an almost linear rate as the velocity max increases.

**Figure 3:** Slope vs. Velocity Max



**Question 6:**

**Figure 4:**



**Question 7:**

