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PHYS 265

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Apollo Mission Report

I. Introduction

```
import numpy as np
import matplotlib.pyplot as plt
from matplotlib.colors import LogNorm
from scipy.integrate import quad
```

Before doing the actual coding and inputting of the function, my first step was to define all the relevant physical constants and import NumPy, matplotlib for both pyplot and colors, and SciPy. The purpose of NumPy is to provide efficient operations on arrays. NumPy also offers a hefty set of mathematical functions going up to linear algebra and random number generator. The purpose of matplotlib is to create interactive and animated data visualizations in a variety of formats. Doing so will enable you to plot line graphs, scatter plots, bar charts, histograms, and 3D plots. The purpose of SciPy is to

```
G = 6.67e-11            #Gravational Constant         m^3/kg/s^2
M_earth = 5.9e24        #Mass of the Earth            kg
M_moon = 7.3e22         #Mass of the Moon             kg
R_earth = 6378          #Radius of the Earth          km
R_moon = 1737           #Radius of the Moon           km
d_earthtomoon = 3.8e8   #Distance from Earth to Moon  km
```

These are the relevant physical constants needed for this report. I proceeded with defining Gravitational Potential, r, and phi. In this definition, I used the function np.errstate(). This function serves to briefly manage floating-point error handling behavior and it allows for specific code blocks to execute and handling floating-point operations. I proceed to define the array of x and phi. To plot for this entire project, I used object-oriented plot interface. This interface provides a structured and flexible way to create and manipulate plots

I proceed to define the array for x &y range. I also use the meshgrid function. This function is used to create a rectangular grid from two one-dimensional arrays.

II. The Gravitational Potential of the Earth System

I started with defining the x & y positions of both the earth and moon.

III. The Gravitational Force of the Earth-Moon System

IV. Project Performance of the Saturn V Stage 1

V. Discussion and Future Work