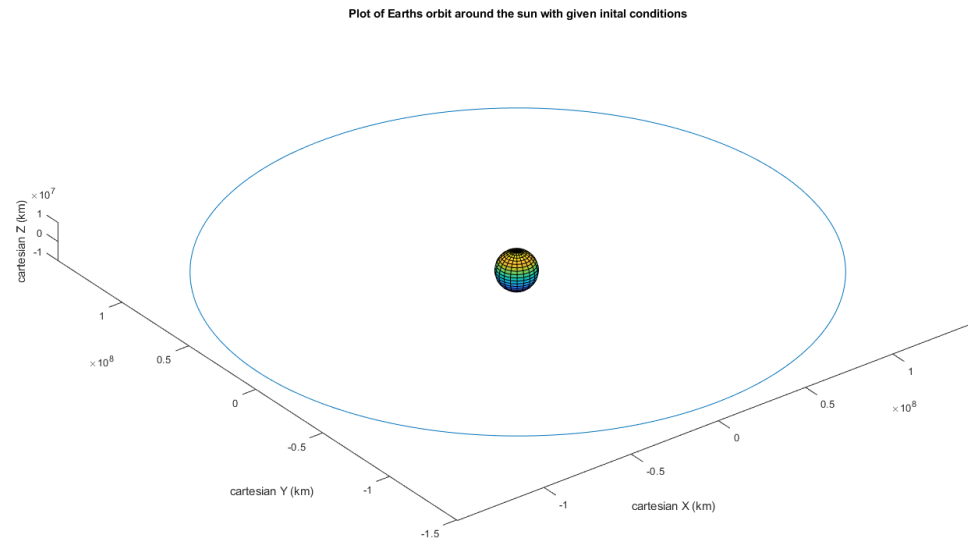
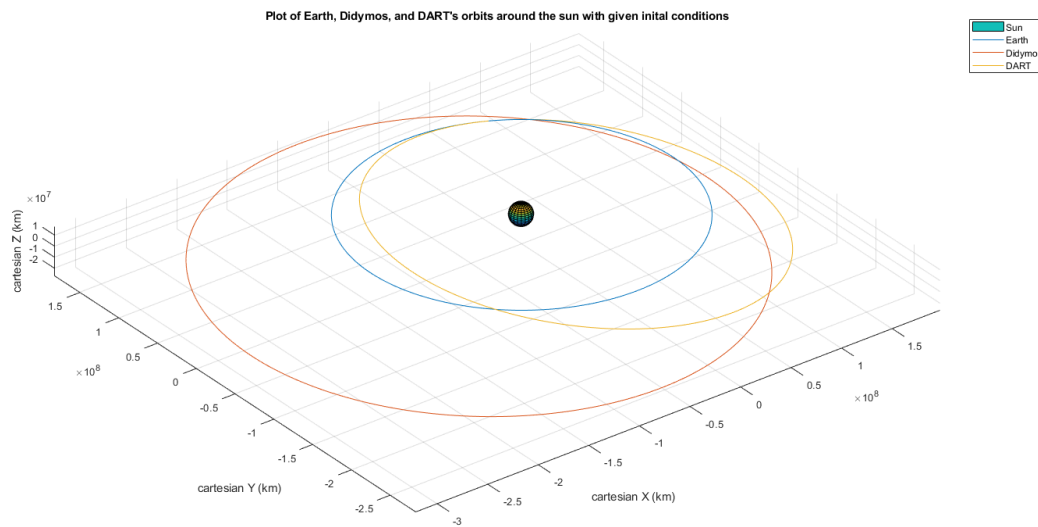
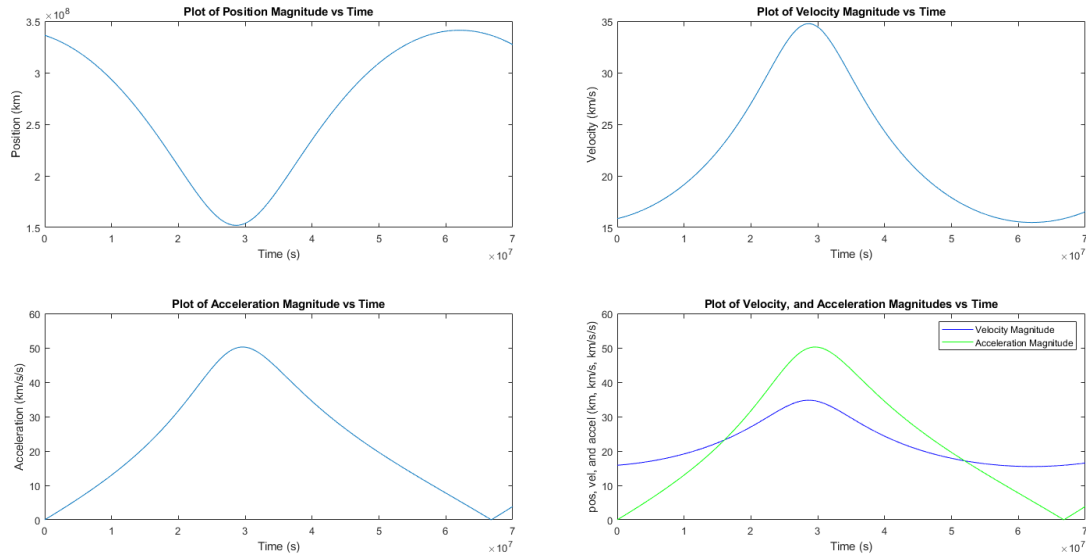


Preliminary Work:

Q1)



Q2)



Q3)

To me, the magnitude plots make sense because the given equation of motion relies on the radius of the body to the central planet (the sun). Since the radius varies within the orbit, you should expect to see variations in a planet's speed and acceleration (and, of course, its position). If the position were thought to behave like a cosine function, then it makes sense that the velocity plot would like a sine function (the derivative of the cosine), or at least that their crests and troughs would be swapped (I think?). But, to summarize, it makes sense that as the Didymos gets closer to the sun, its velocity and acceleration will increase, because it's experiencing a larger gravitational force!

Q4)

Didymos Final State Vector:

$$\begin{aligned}
 | X &= -195277874.348987 \text{ (km)} & | \\
 | Y &= -262465171.020025 \text{ (km)} & | \\
 | Z &= 6558785.74996602 \text{ (km)} & | \\
 | vX &= 15.0133881743423 \text{ (km/s)} & | \\
 | vY &= -6.82831729701378 \text{ (km/s)} & | \\
 | vZ &= -0.972618243181786 \text{ (km/s)} & |
 \end{aligned}$$

\*See attached source code