# Introduction:

In a ballistic missile trajectory simulation, the system of DEs used to describe the ballistic model is a highly complex system. In particular, the six-degree of freedom model used most frequently solves for the missile's components of acceleration, velocity, and position at discrete time intervals. The usual method for simulation is the 4th Order Runge Kutta method. This poster will be diving into a different, and potentially more efficient algorithm, called the Parker-Sochacki Method (PSM for short).

# Assumptions and Variables:

# Problem Identification:

* Model takes initial conditions of acceleration, position, and so on
* Uses the Cauchy product method to solve for coefficients to be used in a power series
* The power series takes an initial time and coefficients of and uses time steps as it goes through the series to accurately approximate the next values in the series
* The order of the series effects the accuracy of the values that will be calculated

# Conclusion:

PSM is an efficient and highly adaptive way to simulate ballistic missile trajectory.  By plugging in initial conditions of position, velocity, and acceleration, it can accurately simulate the trajectory of a missile in various situations.  As can be seen in the graphs and data points, the model works as stated. The advantage of being able to take larger time steps with PSM compared to RK4 means that any data stored on computers used for solving the simulations are much less, and can be computed faster, while also taking up less space. Overall, PSM can be used in a variety of different applications, as a fast and powerful algorithm.