1) Timing Studies: Before starting this program, I assumed that there would be a correlation between number of particles and runtime. As it turns out, I was correct; however, I assumed a linear correlation, and judging by the data, there is not a linear correlation. In fact, it looks like there is an exponential curve to the data. In fact, I could fit a curve to the plotted data and fit an equation to the data with an R^2 value of 0.9923. This proves that there is a correlation between data count and runtime. Additionally, using this trendline equation, one could possibly predict values outside of the measured data (extrapolate).

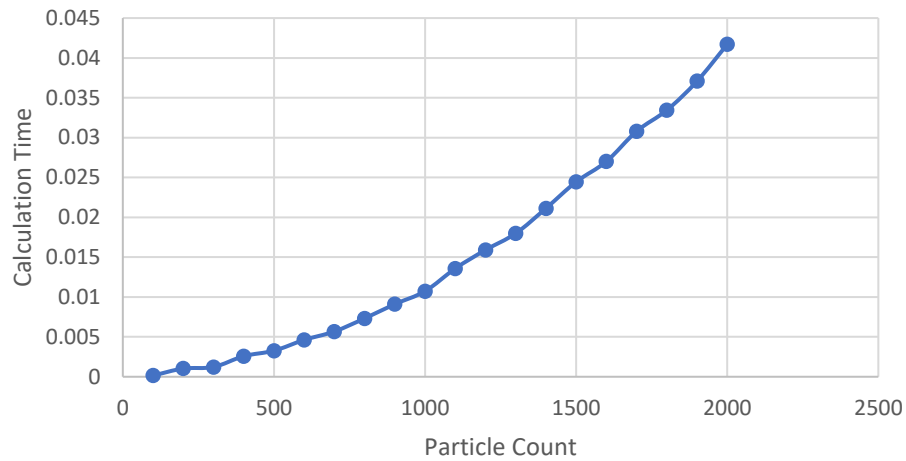*2) Runtime Data:* I addressed many of the runtime expectations in question 1.

3) Time Spent: I spent a bit more time on this project than I had anticipated. I estimated that it would take 9-12 hours, and I probably spent somewhere between 15-20 hours. I'm guessing that the complexity of the GUI was what accounted for the additional time. I usually do well when programming code that isn't GUI based, but the GUI adds a whole new spin to the coding side of the program that is harder to adapt to.

4) Most Time Consuming: The most time consuming part of the program was getting the satellites to function properly. I had set all the classes up, but then when running the GUI, I had difficulty first getting things to show up on the screen, then having them move properly, etc. I probably could have planned a little bit more time for this assignment, but for the most part I feel like I spread the project out throughout the week well. I think the biggest time consumption was the wait-line in the CADE lab. I think my shortest wait time was an hour and a half, and sometimes the TAs would only be able to get to 3-4 students during their scheduled hours. When a TA could assist me, they often could solve whatever problem I was stuck on and help me move forward with the assignment.

5) In the Satellite class, the only method that was abstract was the update_display_size() method. By implementing all the other methods, it was very easy to make sub classes for the star, flotsam, planet, and black hole classes. The "instance of" was used during the Supernova part of the assignment. It had to search through an ArrayList of satellites, and if they were an "instanceof" a specific satellite, the mouse pressed routine would cause a specific set of behavior.

6) Other thoughts: This project was a little bit exciting, but felt like a lot more work than I first thought it would be. I did, however, feel like it was a great review of GUI concepts, inheritance, and polymorphism. These are key topics for CS, and this was a great way to refresh the importance and use of them. If I had more time, I would like to play with simple animations, and maybe add a controllable spaceship.

Speed Analysis of Simulation

Speed Analysis of Simulation

$y = 1.7805\ln(x) - 16.756$

$R^2 = 0.9923$