Computing report

Introduction

* Calculating the cross section is an important thing to do in particle physics
* Two -to -two processes require integration of two variables
* In general, a two to n process requires integration of 3n-4 variables
* Normal processes in the lhc has hundreds of particles, meaning multidimensional integrals are required
* At this point it is practically impossible to do analytical integrations
* Have to resort to numerical integrations
* Investigate numerical methods in doing integration techniques
* The aim of this project is to investingate doing multi-dimensional integrals using numerical methods.
* Goal is to investigate quadrature methods and monte carlo in 1d, generalize to n dimensions, and investigate results

Physics review

* Midpoint rule
* Trapezium rule
* Simpsons rule
* ^make sure this is a really short discussion for this
* Talk about the convergences of the thingys
* Newton-cotes rule in general
* Adaptive integration
* Monte carlo
* General discussion about converting it to an n-dimensional integration

Algorithms and code structure

* All done in one single integrator class
* Code generally follows the exact mathematical definitions for each of the newton-cotes quadrature method
* Random number generator was required for monte carlo shts
* Recursion was used for adaptive integration
* Talk about the generator thingy and why that was required
* Results
  + Show that the newton cotes is superior in the one dimensional case
  + show that the one d convergers are accurate to the ones mentioned there
  + show that monte carlo is superior in the four dimensional case
  + validity? Probably compare it with known thingys
* Conclusion
  + Shruggie
* abstract: provide a short summary of the project and results, no more than a paragraph.
* introduction: introduce the problem being addressed in the project.
* physics review: review the relevant literature and physics of the problem, include references.
* algorithms and code structure: introduce the algorithms implemented and provide an overall outline of the code structure you implemented. Explain any interesting problems or details. Code snippets are fine, but not large blocks of code. Pseudo-code is also helpful.
* results: present the results of your code and discuss implications. Demonstrate the validity of the results.
* conclusion: draw any final conclusions and explain possible work that could be undertaken in the future.
* bibliography: ensure that proper referencing is used throughout the report.
* appendices: appendices can be included, but do not include your code. This should be provided independently as a Python file(s).