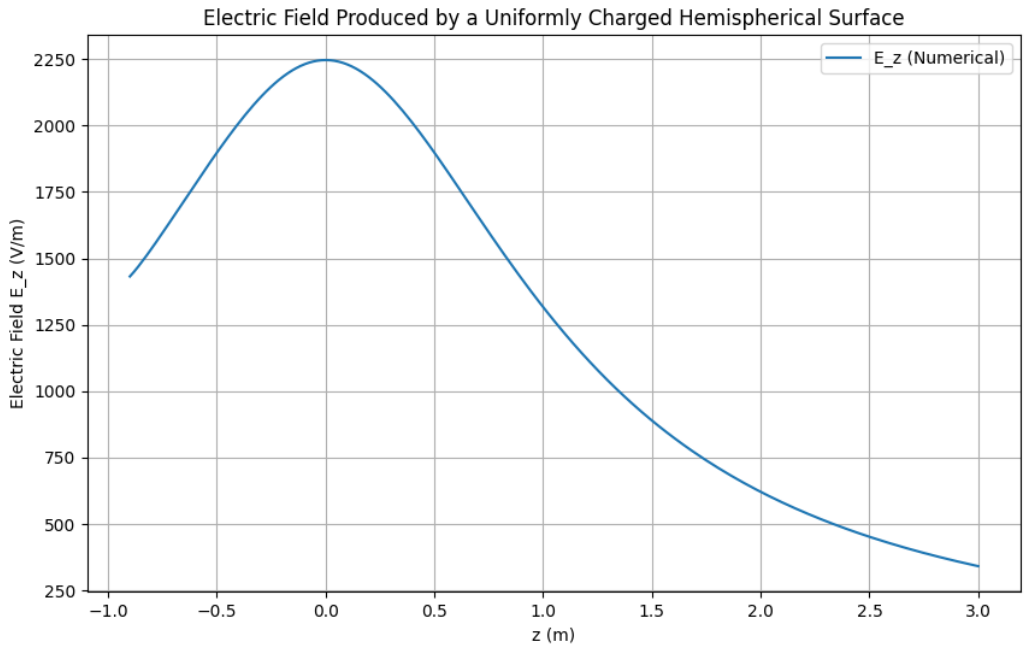
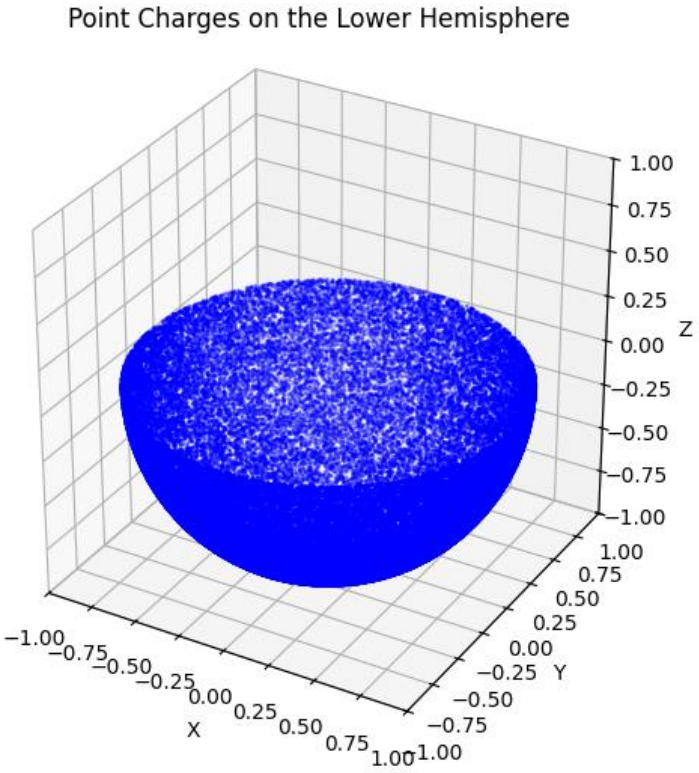
Numerical Assignment Todd Blacklaw H00368671





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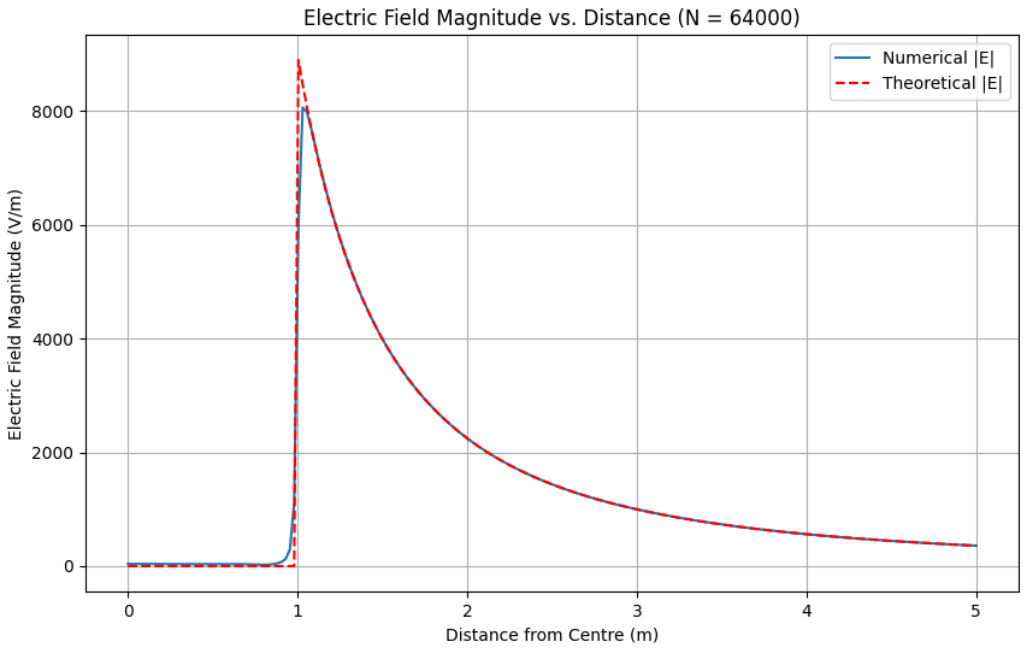

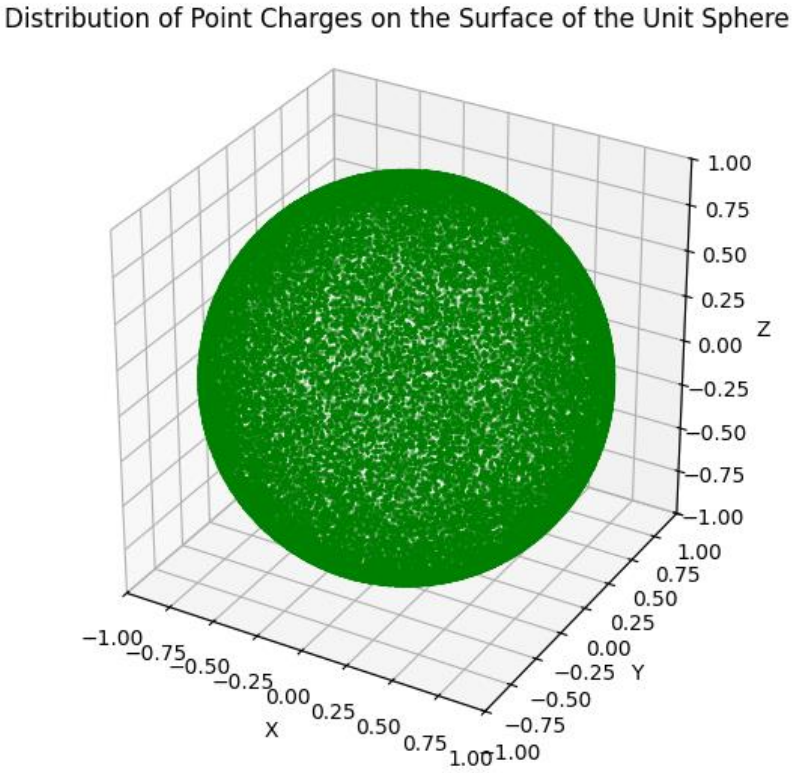

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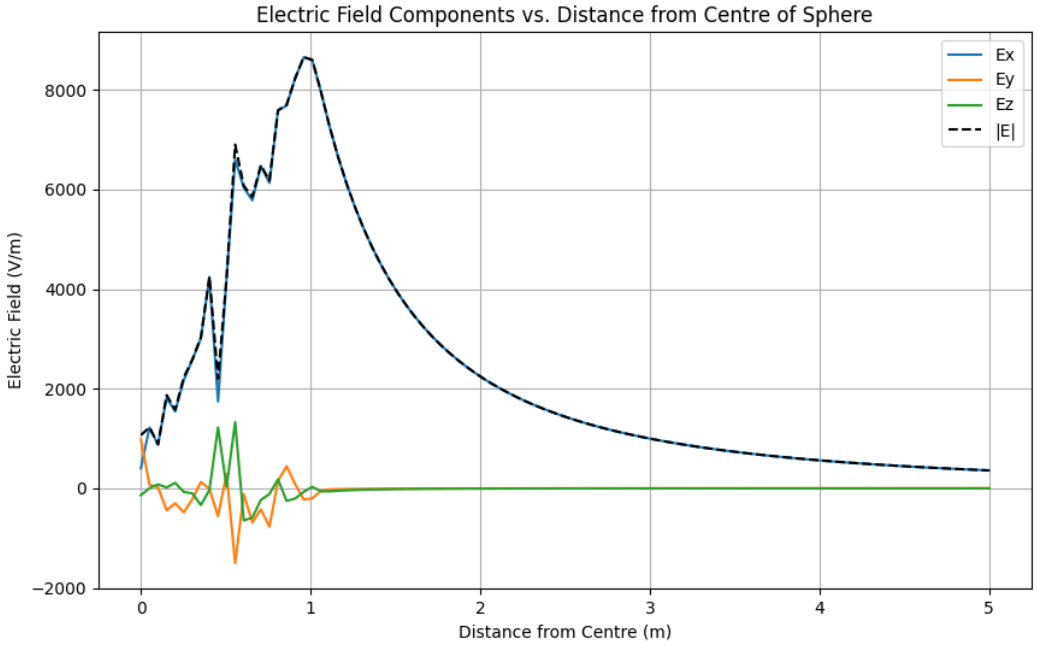

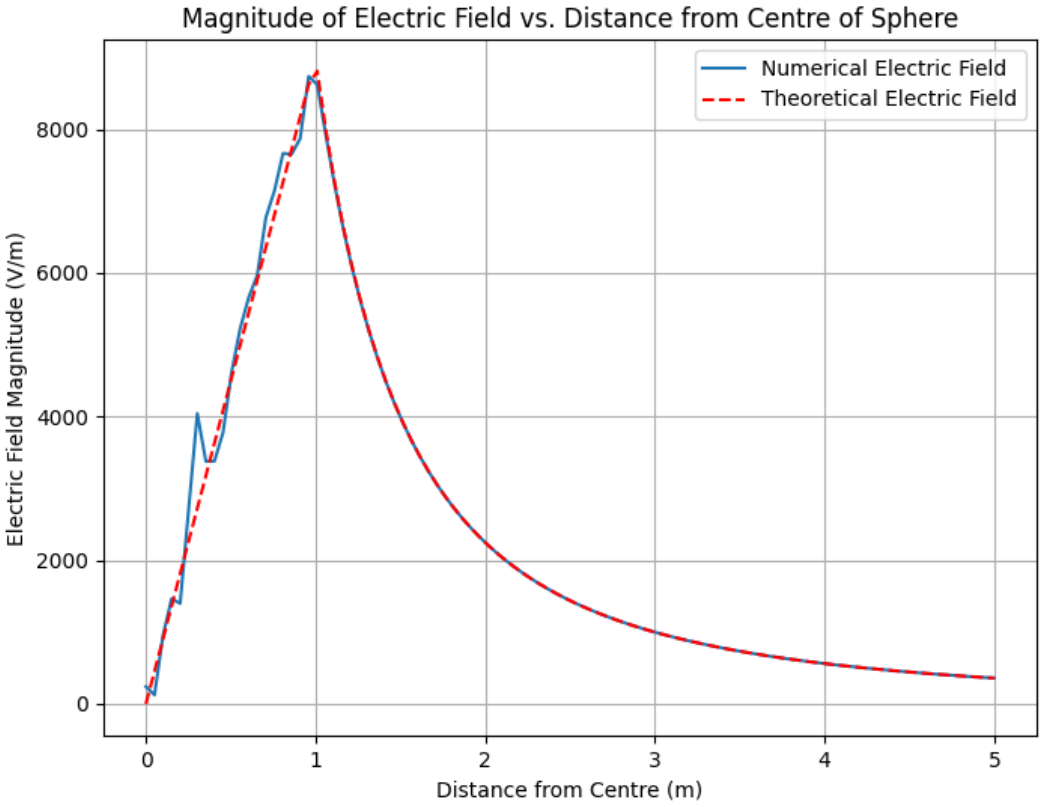

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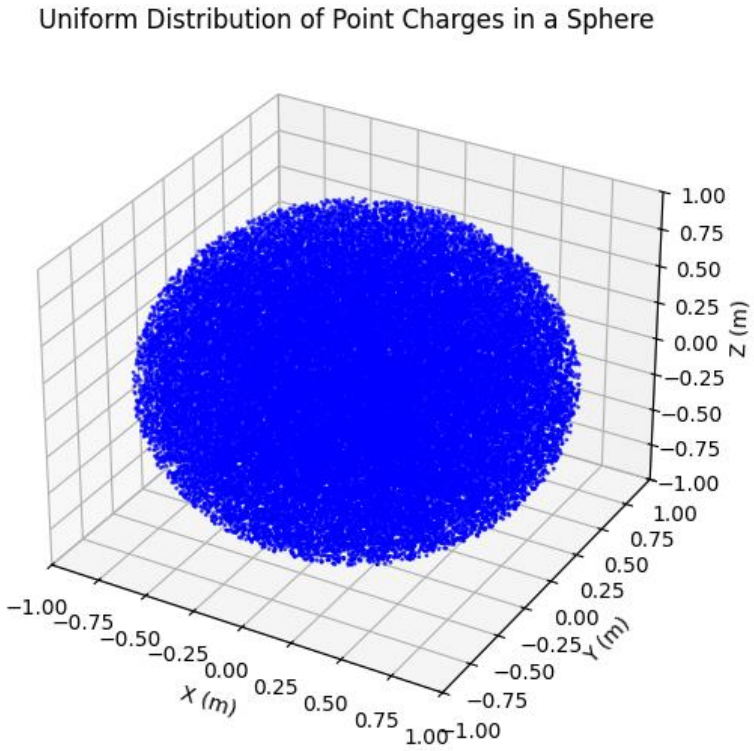


```
[Running] python -u "c:\Users\toddb\Desktop\Uni\test2.py"
Part A
Electric field at point [0.  0.5 0. ] due to two charges at positions [-1.  0.  0.] and [1. 0. 0.]:
E_total = [[0.         6.43110498 0.        ]] V/m

Electric field at point [0.5 0.  0. ] due to two charges at positions [ 0. -1.  0.] and [0. 1. 0.]:
E_total = [[6.43110498 0.         0.        ]] V/m
Part B
Total number of point charges generated: 100000
Number of point charges inside the sphere: 52173
Charge per point charge: 1.9167002089203226e-11 C
Total charge of the sphere: 1e-06 C
Part C
Iteration 1: N_total = 10000, Max Relative Error = 0.0210
Iteration 2: N_total = 20000, Max Relative Error = 0.0165
Iteration 3: N_total = 40000, Max Relative Error = 0.0103
Iteration 4: N_total = 80000, Max Relative Error = 0.0007
Desired accuracy achieved.
```

```
Part D
Part E
Iteration 1: N = 1000, Max Relative Error (outside) = 0.1017, Max Absolute Error (inside) = 1.1492e+03
Iteration 2: N = 2000, Max Relative Error (outside) = 0.0835, Max Absolute Error (inside) = 1.0143e+03
Iteration 3: N = 4000, Max Relative Error (outside) = 0.0200, Max Absolute Error (inside) = 7.4815e+02
Iteration 4: N = 8000, Max Relative Error (outside) = 0.0260, Max Absolute Error (inside) = 2.5572e+02
Iteration 5: N = 16000, Max Relative Error (outside) = 0.0156, Max Absolute Error (inside) = 3.5919e+02
Iteration 6: N = 32000, Max Relative Error (outside) = 0.0285, Max Absolute Error (inside) = 2.2064e+02
Iteration 7: N = 64000, Max Relative Error (outside) = 0.0017, Max Absolute Error (inside) = 6.7115e+01
Desired accuracy achieved.

Up to the nearest order of magnitude, the number of sample points required is 10^4.
Part F
Number of point charges in the hemisphere: 49568
Charge per point charge: 1.0087153001936732e-11 C

[Done] exited with code=0 in 69.544 seconds
```