Project #4

1. Suppose the computational domain $D$ is $[-1,1] \times [-1,1]$. Consider atoms at $(x_j, y_j)$, for $j = 1, \ldots, 500$, where $h = 2\pi/500$, and $\theta_j = j \cdot h$, and $x_j = \pi/30 + 0.7 \cos \theta_j$ and $y_j = \sqrt{2}/5 + 0.4 \sin \theta_j$. Suppose the atom at $(x_j, y_j)$ has charge $q_j$, where $q_j = x_j + 1$. Laying down a $101 \times 101$-size grid, with stepsize $2/100$ in each dimension, use the multipole method, with $p = 10$ term expansions and maximum level 5 ($32 \times 32$ grid) or level 0 (choose one), to compute, at each grid point $(x, y)$,

$$g(x, y) = -\sum_{j=1}^{500} q_j \log(\sqrt{(x - x_j)^2 + (y - y_j)^2}).$$

Plot your values of $g$ over the grid and turn in the plot.