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HW 2

2.3) The algorithm I would implement would use the fact that

to decompose in to two component parts, and . With this,

and

Through a Taylor expansion, one gets

Subtracting these two equations from one another leads to

Which can be rearranged to

Which can be rewritten as

allows me to use the potential values on an evenly spaced grid given by some and where and are the number of and from a given boundary. Using this, I can write a nested for loop to go through the grid points and calculate and . Thus, for each grid point,

Another advantage of this approach over only using a forward difference such as V(j+1)-V(j) is that it is symmetric – if using the forward difference, there is no justification for why a backwards difference should not be used, e.g., V(j)-V(j-1). Your equation is the average of the forward and backwards difference.

Notice that the indices are flipped to incorporate the minus sign in

To calculate the electric field outside of the grid points, bilinear interpolation would be a sufficient strategy to estimate the electric field

Why sufficient? (If you say this, you need to justify. Here you can just say ‘bilinear can be used’ … and tests could be performed to determine its performance.)