

Electric Potentials from Two Charges

Your group will be assigned one of the following problems. Work out your problem by brainstorming together on a big whiteboard and answer the following questions:

- For what values of \vec{r} does your series converge?
- For what values of \vec{r} is your approximation a good one?
- Which direction would a test charge move under the influence of this electric potential?

Then write a clean version of your solution (with a reasonable number of intermediate steps) on a new board. If your group gets done early, go on to another problem. The fourth problem in each set is the most challenging, and the most interesting.

- Two charges $+Q$ and $+Q$ are placed on a line at $z = -D$ and $z = +D$ respectively.
 - What is a fourth order approximation to the electric potential $V(\vec{r})$ for $y = z = 0$ and $|x| \ll D$?
 - What is a fourth order approximation to the electric potential $V(\vec{r})$ for $x = y = 0$ and $|z| \ll D$?
 - What is a fourth order approximation to the electric potential $V(\vec{r})$ for $y = z = 0$ and $|x| \gg D$?
 - What is a fourth order approximation to the electric potential $V(\vec{r})$ for $x = y = 0$ and $|z| \gg D$?
- Two charges $-Q$ and $+Q$ are placed on a line at $z = -D$ and $z = +D$ respectively.
 - What is a fourth order approximation to the electric potential $V(\vec{r})$ for $y = z = 0$ and $|x| \ll D$?
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by Corinne Manogue

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