Find a third order approximation to the electrostatic potential $V(\vec{r})$ for one of the following physical situations.

1. Two charges $+Q$ and $+Q$ are placed on a line at $z = D$ and $z = -D$ respectively.
   a) On the x-axis for $|x| \ll D$?
   b) On the z-axis for $|z| \ll D$?
   c) On the x-axis for $|x| \gg D$?
   d) On the z-axis for $|z| \gg D$?
2. Two charges $+Q$ and $-Q$ are placed on a line at $z = +D$ and $z = -D$ respectively.
   a) On the x-axis for $|x| \ll D$?
   b) On the z-axis for $|z| \ll D$?
   c) On the x-axis for $|x| \gg D$?
   d) On the z-axis for and $|z| \gg D$?

Work out your problem by brainstorming together on a big whiteboard and also 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?

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.