Power Series for Two Point Charges

Each of the power series below comes from expanding the electrostatic potential due to a pair of positive charges OR a pair of opposite charges lying along the z-axis at $\pm D$. The expansions are along either the z-axis OR the the x-axis for either large or small values of the variable z or x.

Match each series to the region where it is valid. Be prepared to explain your reasoning. Then give a physical explanation for as many terms of the series as you can.

1. $\frac{Q}{4\pi\epsilon_0}\frac{2}{D}\left(1+\frac{z^2}{D^2}+\frac{z^4}{D^4}+...\right)$

2. 0

3. $\frac{Q}{4\pi\epsilon_0}\frac{2}{|x|}\left(1-\frac{1}{2}\frac{D^2}{x^2}+\frac{3}{8}\frac{D^4}{x^4}+...\right)$

4. 0

5. $\frac{Q}{4\pi\epsilon_0}\frac{2}{D}\left(\frac{z}{D}+\frac{z^3}{D^3}+\frac{z^5}{D^5}+...\right)$

6. $\frac{Q}{4\pi\epsilon_0}\frac{2}{|z|}\left(1+\frac{D^2}{z^2}+\frac{D^4}{z^4}+...\right)$

7. $\frac{Q}{4\pi\epsilon_0}\frac{2}{D}\left(1-\frac{1}{2}\frac{x^2}{D^2}+\frac{3}{8}\frac{x^4}{D^4}+...\right)$

8. $\frac{Q}{4\pi\epsilon_0}\frac{2}{|z|}\left(\frac{D}{z}+\frac{D^3}{z^3}+\frac{D^5}{z^5}+...\right)$