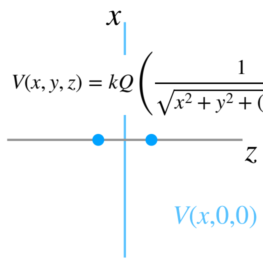
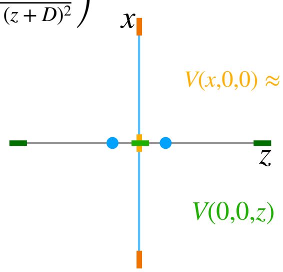


$$V(x,y,z) = kQ\left(\frac{1}{\sqrt{x^2+y^2+(z-D)^2}} + \frac{1}{\sqrt{x^2+y^2+(z+D)^2}}\right)$$

$$V(x,0,0) = \frac{2kQ}{\sqrt{x^2+D^2}}$$

$$V(0,0,z) = kQ\left(\frac{1}{|z-D|} + \frac{1}{|z+D|}\right)$$

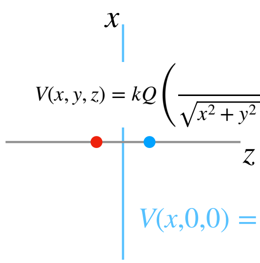


$$V(x,0,0) \approx \frac{2kQ}{|x|}\left[1 - \frac{1}{2}\frac{D^2}{x^2}\right]$$

$$V(x,0,0) \approx \frac{2kQ}{D}\left[1 - \frac{1}{2}\frac{x^2}{D^2}\right]$$

$$V(0,0,z) \approx \frac{2kQ}{D}\left[1 + \frac{z^2}{D^2}\right]$$

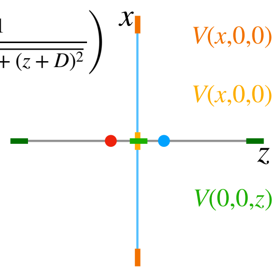
$$V(0,0,z) \approx \frac{2kQ}{|z|}\left[1 + \frac{D^2}{z^2}\right]$$



$$V(x,y,z) = kQ\left(\frac{1}{\sqrt{x^2+y^2+(z-D)^2}} - \frac{1}{\sqrt{x^2+y^2+(z+D)^2}}\right)$$

$$V(x,0,0) = 0$$

$$V(0,0,z) = kQ\left(\frac{1}{|z-D|} - \frac{1}{|z+D|}\right)$$



$$V(x,0,0) = 0$$

$$V(x,0,0) = 0$$

$$V(0,0,z) \approx \frac{2kQ}{D}\left[\frac{z}{D} + \frac{z^3}{D^3}\right]$$

$$V(0,0,z) \approx \frac{2kQ}{D}\left[\frac{D^2}{z^2}\right]\text{sgn}(z)$$

- Sign of charge
- 3D
- $\vec{r} - \vec{r'}$ to get the shift correct
- Make sure “distances” are positive
- PS: use a known series

$$(1+z)^p = 1 + pz + \frac{p(p-1)}{2!}z^2 + \frac{p(p-1)(p-2)}{3!}z^2 + \ldots$$

- PS: Factor out the thing that is large
- PS: No power series in denominator
- PS: Algebra, factoring from negative exponentials
- All even symmetries except on the z-axis for unlike charges