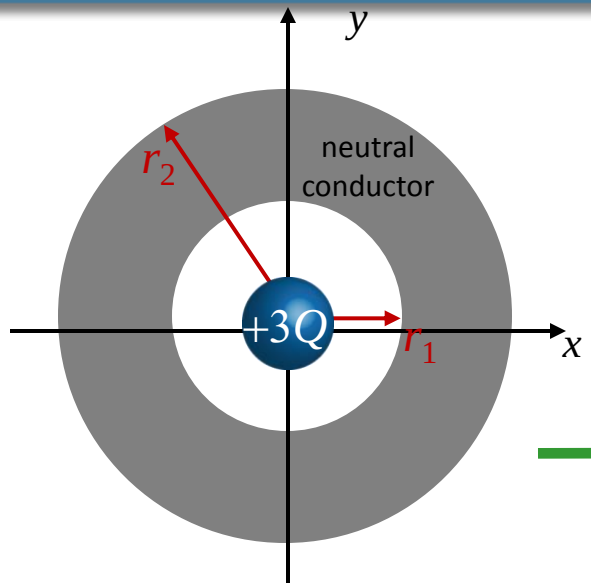
Calculation



Point charge $+3Q$ at center of neutral conducting shell of inner radius r_1 and outer radius r_2.

A) What is E everywhere?

We know:

magnitude of E is *fcn* of r

direction of E is along $\hat{r}$

We can use Gauss' Law to determine E

Use Gaussian surface = sphere centered on origin

$$\int \vec{E} \cdot d\vec{A} = \frac{Q_{enc}}{\varepsilon_0}$$

$r < r_1$

$$\int E dA = \frac{Q_{enc}}{\varepsilon_0}$$

$$E 4\pi r^2 = \frac{+3Q}{\varepsilon_0}$$

$$E = \frac{1}{4\pi\varepsilon_0}\frac{3Q}{r^2}$$

$r_1 < r < r_2$

A) $E = \frac{1}{4\pi\varepsilon_0}\frac{3Q}{r^2}$

B) $E = \frac{1}{4\pi\varepsilon_0}\frac{3Q}{r_1^2}$

C) $E = 0$

$r > r_2$

A) $E = \frac{1}{4\pi\varepsilon_0}\frac{3Q}{r^2}$

B) $E = \frac{1}{4\pi\varepsilon_0}\frac{3Q}{(r-r_2)^2}$

C) $E = 0$