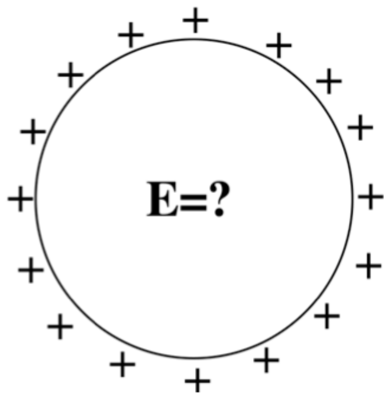
A spherical *shell* has a uniform positive charge density on its surface. (There are no other charges around.)

What is the electric field *inside* the sphere?



A. $\mathbf{E} = 0$ everywhere inside

B. $\mathbf{E}$ is non-zero everywhere in the sphere

C. $\mathbf{E} = 0$ only that the very center, but non-zero elsewhere inside the sphere.

D. Not enough information given

EXAM 1 INFORMATION

- Exam 1 on Wednesday, October 3rd (BCH 101)
    - Next to BPS (Wilson side)
- 7pm-9pm
    - Arrive on time!
    - Put one seat between you and the next person
- I will provide a formula sheet (posted on Slack already)
- You can bring one-side of a sheet of paper with your own notes.
- 5 questions - True/False, Essay, Code, Graphing, Short Calculations

WHAT'S ON EXAM 1?

- Identify whether conceptual statements about $\mathbf{E}$, V, ρ, and/or numerical integration are true or false.
- Sketch and discuss delta functions in relation to charge density, ρ
- Explain the process for using a computational alogrithm for predicting $\mathbf{E}$ and write the necessary code to illustrate how it works for a given example
- Calculate the electric field, $\mathbf{E}$, inside and outside a continuous distribution of charge and sketch the results
- Calculate the electric potential, V, for a specific charge distribution and discuss what happens in limiting cases

We are trying to compute the the electric potential $V(\mathbf{r})$ for a line of charge at the location $\langle x, 0, z \rangle$. What is $|\mathfrak{R}|$ in this case?

A. x

B. z

C. $\sqrt{x^2 + z^2}$

D. Something else

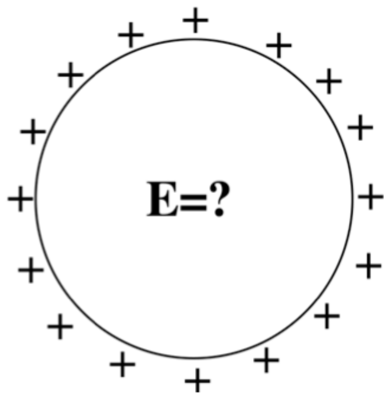
We derived the potential for this short rod to be

$$V(x, z) = \frac{\lambda}{4\pi\varepsilon_0} \log\left[\frac{L + z + \sqrt{x^2 + (L + z)^2}}{L - z + \sqrt{x^2 + (L - z)^2}}\right]$$

The associated electric field at $\langle x, 0, z\rangle$ location can have the following components:

A. only x
B. only y
C. only z
D. x, y, and z
E. Something else

A spherical *shell* has a uniform positive charge density on its surface. (There are no other charges around.)



What is the electric field *inside* the sphere?

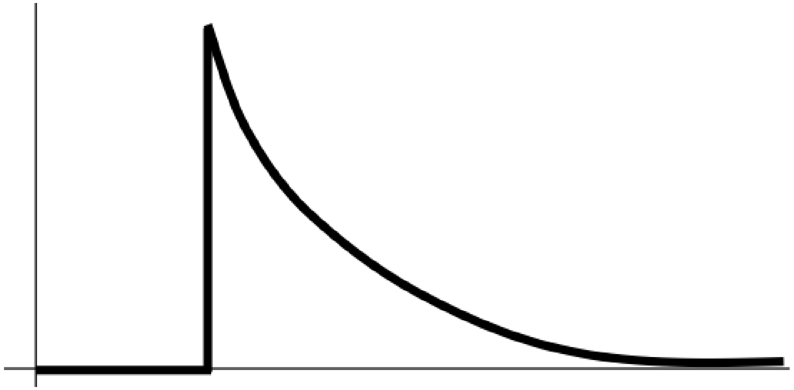
A. $\mathbf{E} = 0$ everywhere inside
B. $\mathbf{E}$ is non-zero everywhere in the sphere
C. $\mathbf{E} = 0$ only that the very center, but non-zero elsewhere inside the sphere.
D. Not enough information given

We derived the electric potential outside ($r > R$) the charged shell to be

$$V(r) = \frac{1}{4\pi\varepsilon_0}\frac{q}{r}$$

What is it for $r < R$?

A. Zero
B. Constant
C. It changes but I don't know how yet
D. Something else



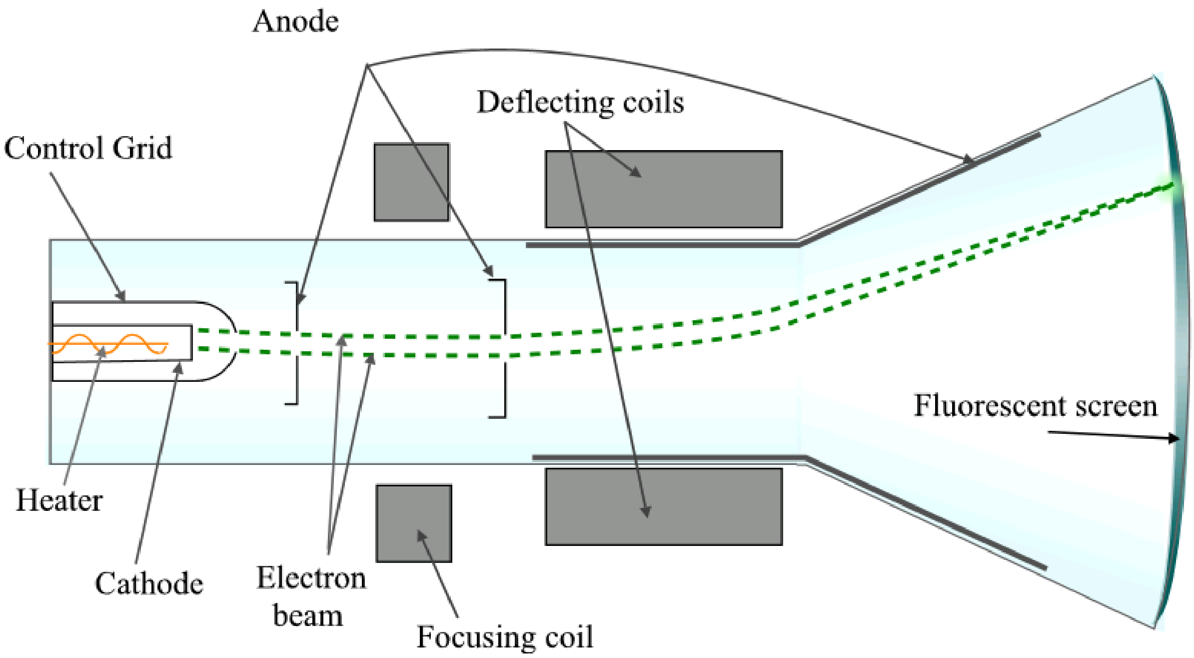
Could this be a plot of $|\mathbf{E}(r)|$? Or $V(r)$? (for SOME physical situation?)

A. Could be $E(r)$, or $V(r)$
B. Could be $E(r)$, but can't be $V(r)$
C. Can't be $E(r)$, could be $V(r)$
D. Can't be either
E. ???

We usually choose $V(r \to \infty) \equiv 0$ when calculating the potential of a point charge to be $V(r) = +kq/r$. How does the potential $V(r)$ change if we choose our reference point to be $V(R) = 0$ where R is close to $+q$.

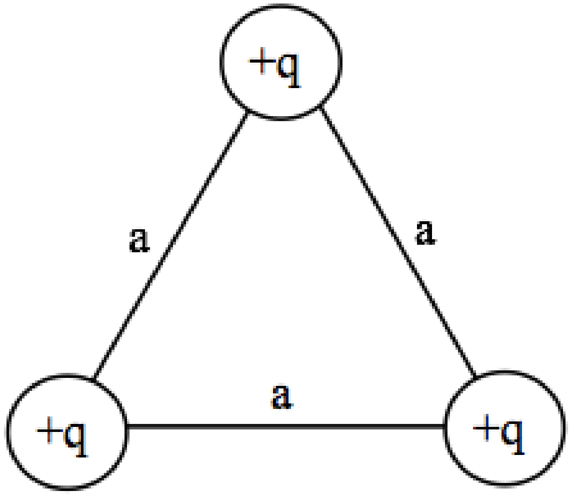
A. $V(r)$ higher than it was before
B. $V(r)$ is lower than it was before
C. $V(r)$ doesn’t change (V is independent of choice of reference)

ELECTROSTATIC POTENTIAL ENERGY



Three identical charges $+q$ sit on an equilateral triangle. What would be the final KE of the top charge if you released it (keeping the other two fixed)?

A. $\frac{1}{4\pi\varepsilon_0}\frac{q^2}{a}$
B. $\frac{1}{4\pi\varepsilon_0}\frac{2q^2}{3a}$
C. $\frac{1}{4\pi\varepsilon_0}\frac{2q^2}{a}$
D. $\frac{1}{4\pi\varepsilon_0}\frac{3q^2}{a}$
E. Other



Three identical charges $+q$ sit on an equilateral triangle. What would be the final KE of the top charge if you released *all three*?

A. $\frac{1}{4\pi\varepsilon_0}\frac{q^2}{a}$

B. $\frac{1}{4\pi\varepsilon_0}\frac{2q^2}{3a}$

C. $\frac{1}{4\pi\varepsilon_0}\frac{2q^2}{a}$

D. $\frac{1}{4\pi\varepsilon_0}\frac{3q^2}{a}$

E. Other