Additional course resources

SI sessions: Monday 11:00 – 11:50AM, BA 126
Tuesday 6:00 – 6:50PM, MAP 121
Wednesday, 11:00 – 11:50AM, BA 126
Thursday 6:00 – 6:50PM, MAP 121

Office hours: Tuesday Thursday 6-7 pm

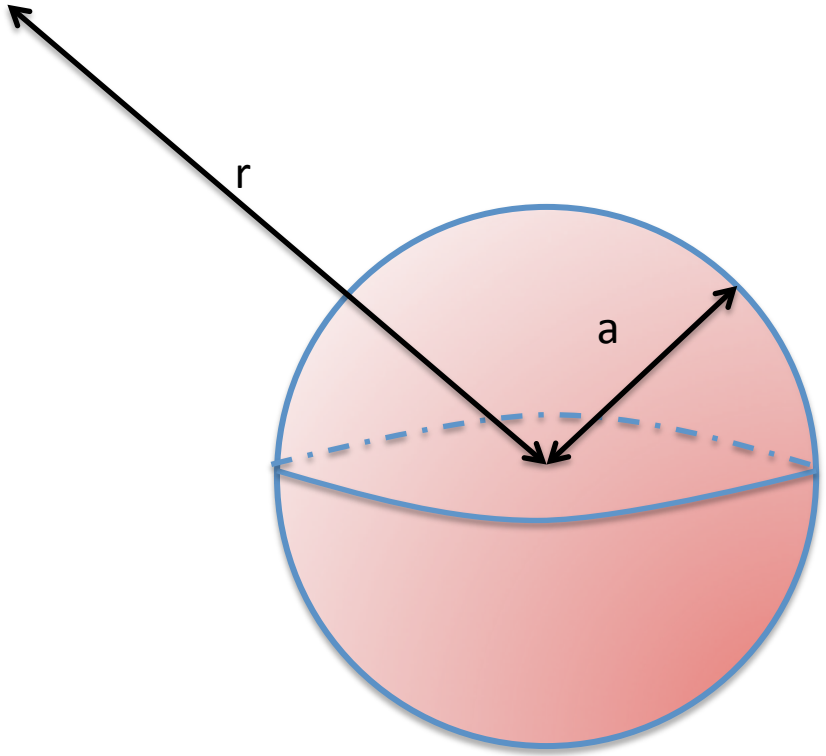
+ additional

A. Tuesday 10:30-noon
B. Thursday 1:00-2:30 pm
C. Extend office hours to 7:45 pm on both days
D. Additional choice desired

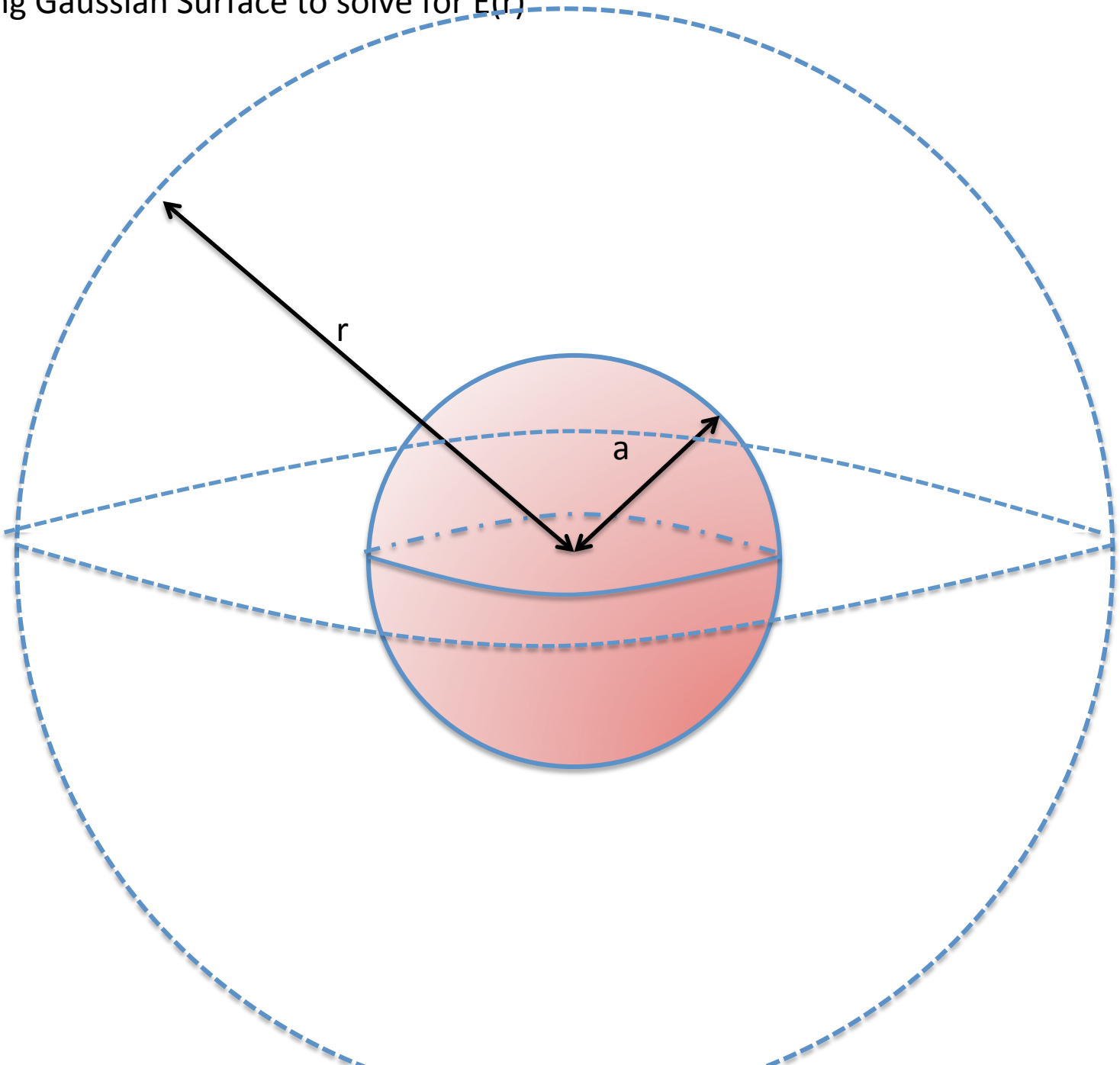
TA office hours: see individual TA's syllabus

Note on Gauss's law : Field by a uniformly charged sphere [total charge: Q]

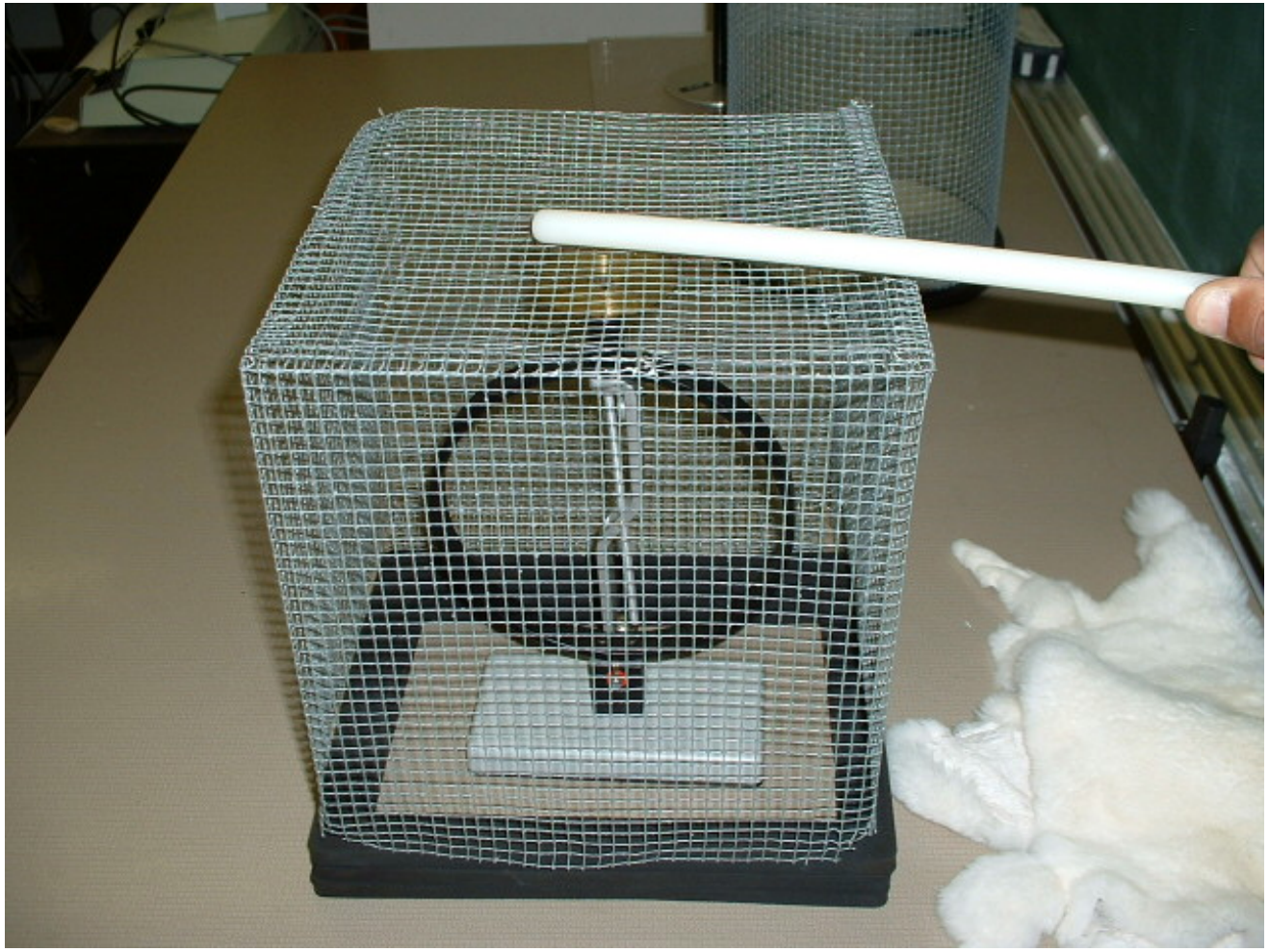
Find electric field everywhere



Defining Gaussian Surface to solve for E(r)



Demo



Last time: electric potential energy and electric potential

$$U = qV$$

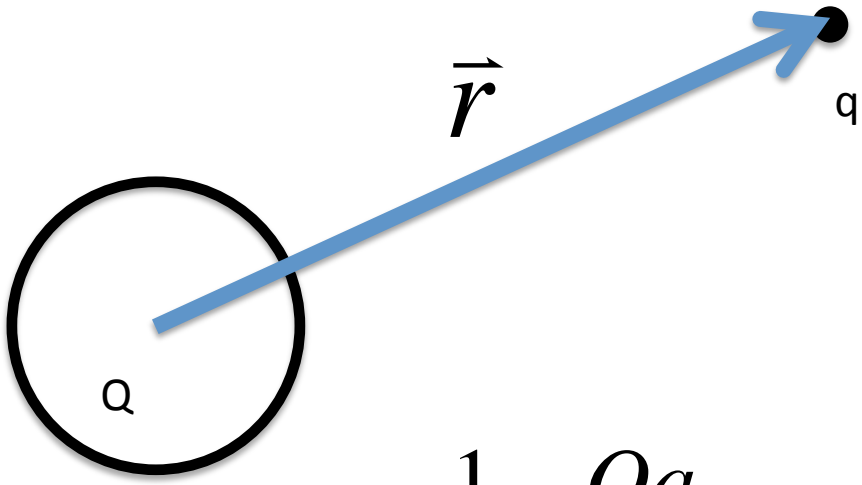
U: electric potential energy (scalar)
q: charge
V: electric potential (scalar)

Interesting points:

1. Zero of electric potential energy and potential
2. Potential to be related to electric field

Problem 1: When a negative charge is released and moves under an influence of an electric field, it moves to a position of

a. lower potential and lower potential energy.
b. lower potential and higher potential energy.
c. higher potential and lower potential energy.
d. higher potential and higher potential energy.
e. decreasing magnitude of the electric field.



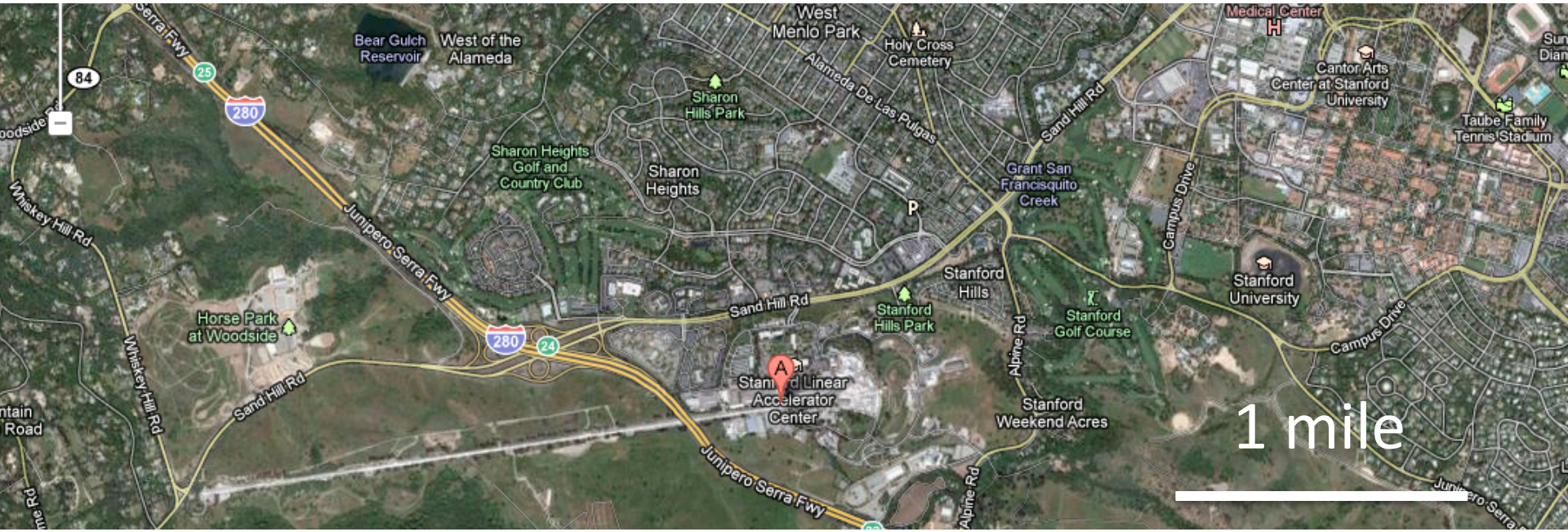
Potential Energy at R : $\frac{1}{4\pi\varepsilon_0}\frac{Qq}{r}$

Potential at R: $V(r) = \frac{1}{4\pi\varepsilon_0}\frac{Q}{r}$

Addition of potential

Doc Cam

Acceleration of Charged Particles



Stanford Linear Accelerator Center: electrons and positrons up to 50 GeV

What is GeV? : giga electron volt

Giga = 10^9

$$V(x) = \frac{1}{4\pi\varepsilon_0}\frac{Q}{x}$$

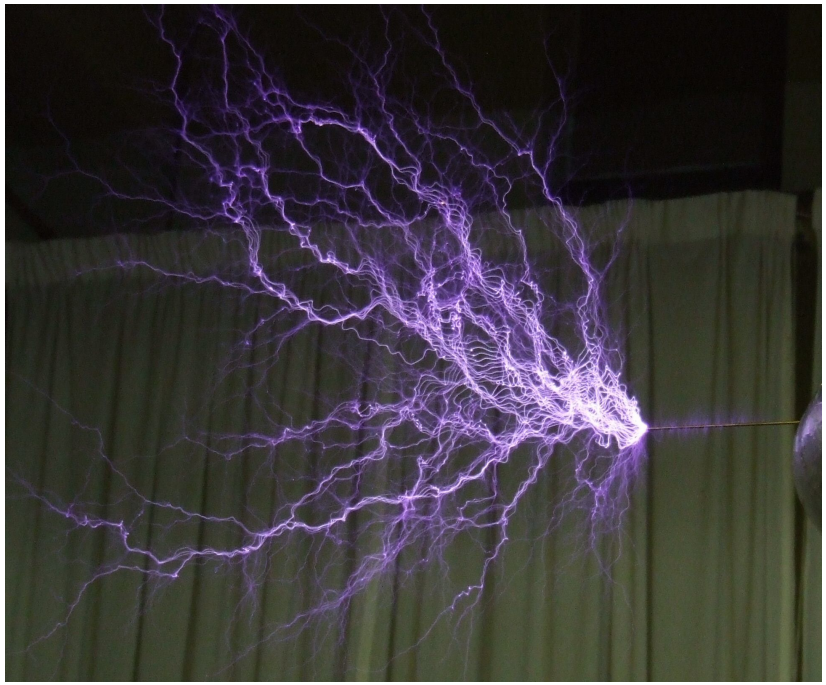
$$\vec{E} = \frac{1}{4\pi\varepsilon_0}\frac{Q}{x^2}\hat{x} = -\frac{dV}{dx}\hat{x}$$

Gradient Discussion: Board

Problem 2: The electric field in a region of space is given by $E_x = (3.0x)$ N/C, $E_y = E_z = 0$, where x is in m. Points A and B are on the x axis at $x_A = 3.0$ m and $x_B = 5.0$ m. Determine the potential difference $V_B - V_A$.

a. –24 V
b. +24 V
c. –18 V
d. +30 V
e. –6.0 V

Arcing Demo



Breakdown strength of air: 3 MV/m

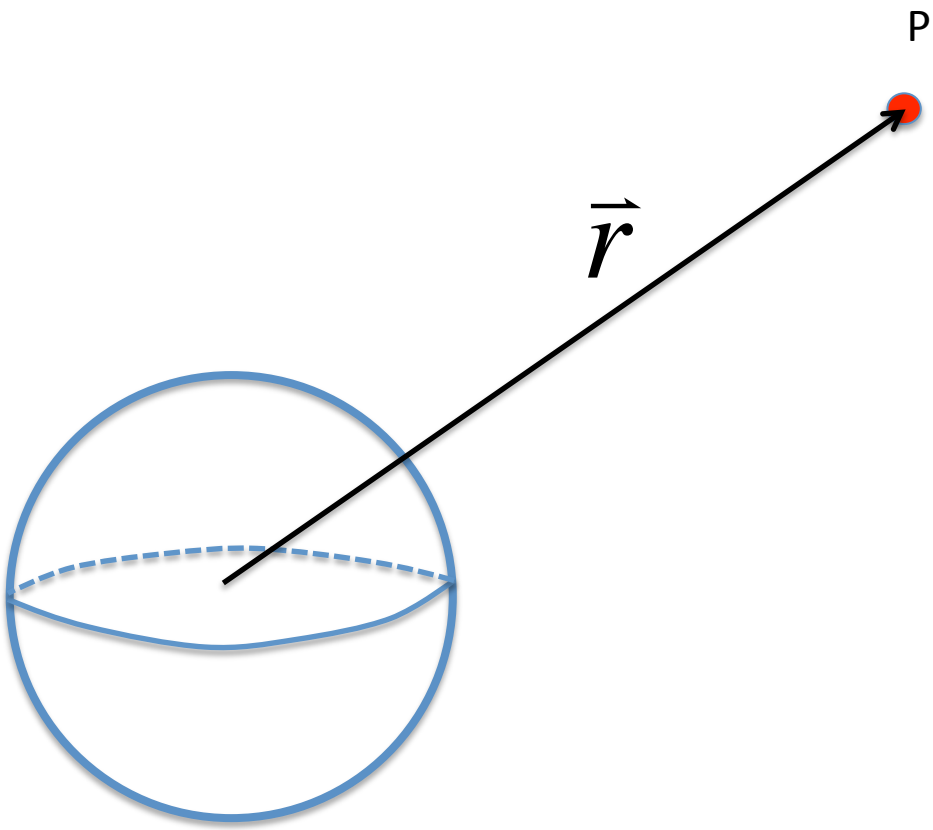
Sharp points seems to be the source. Why?

Example:

Conducting Sphere

Radius: a

Total charge : Q



What about a non-traditional objects?

Conducting irregular shaped object