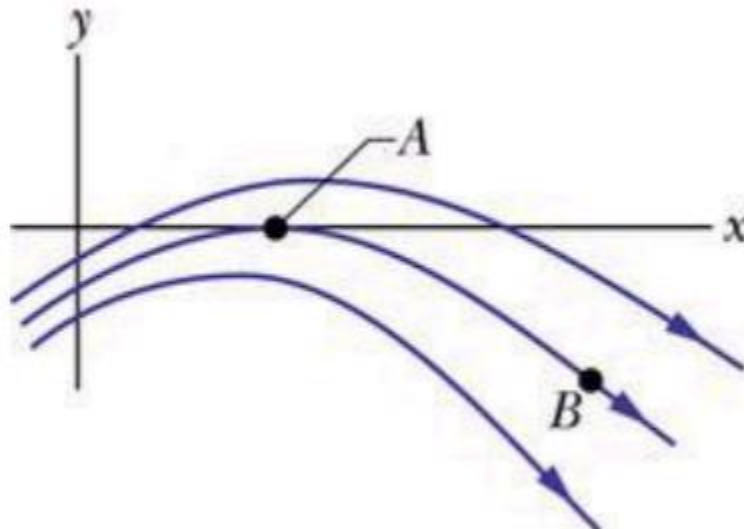


Christian's Practice Exam Problems

Here's a few practice problems. You can take this like a practice exam where you only get some note sheets and your physics knowledge, you can work on this and ask me questions when they come up, or you may work with a group of people. Do whatever works best for you!

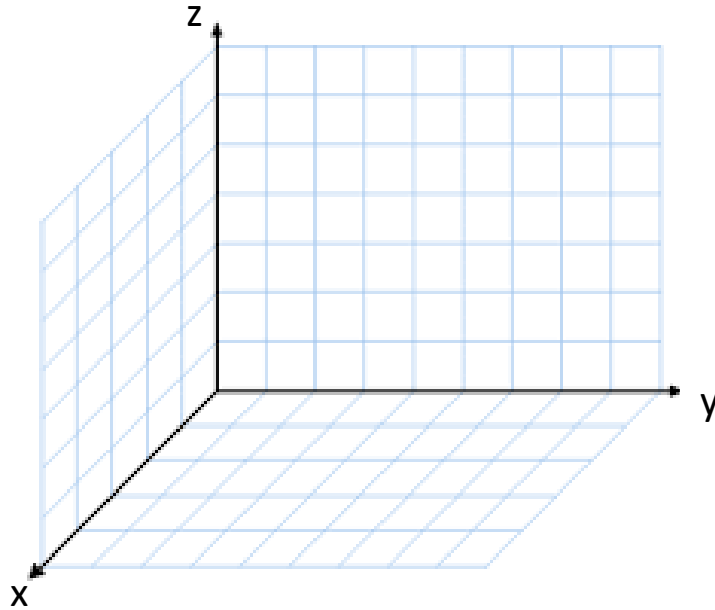
Question 1 – The figure below shows three electric field lines. What is the direction of the electric force on a negative point charge placed at

- Point A
- Point B
- At which point, A or B, will the acceleration of the test charge be greater if the charge is released?



Question 2. There is a -2.0 nC charge at $\langle 1 \text{ } \mu\text{m}, 1 \text{ } \mu\text{m}, 1 \text{ } \mu\text{m} \rangle$, a 1.0 nC charge at $\langle 0 \text{ } \mu\text{m}, 0 \text{ } \mu\text{m}, 1 \text{ } \mu\text{m} \rangle$, and a -1 nC charge at $\langle 1 \text{ } \mu\text{m}, 2 \text{ } \mu\text{m}, 1 \text{ } \mu\text{m} \rangle$.

- a. Draw the charge distribution (i.e., where the charges are located)

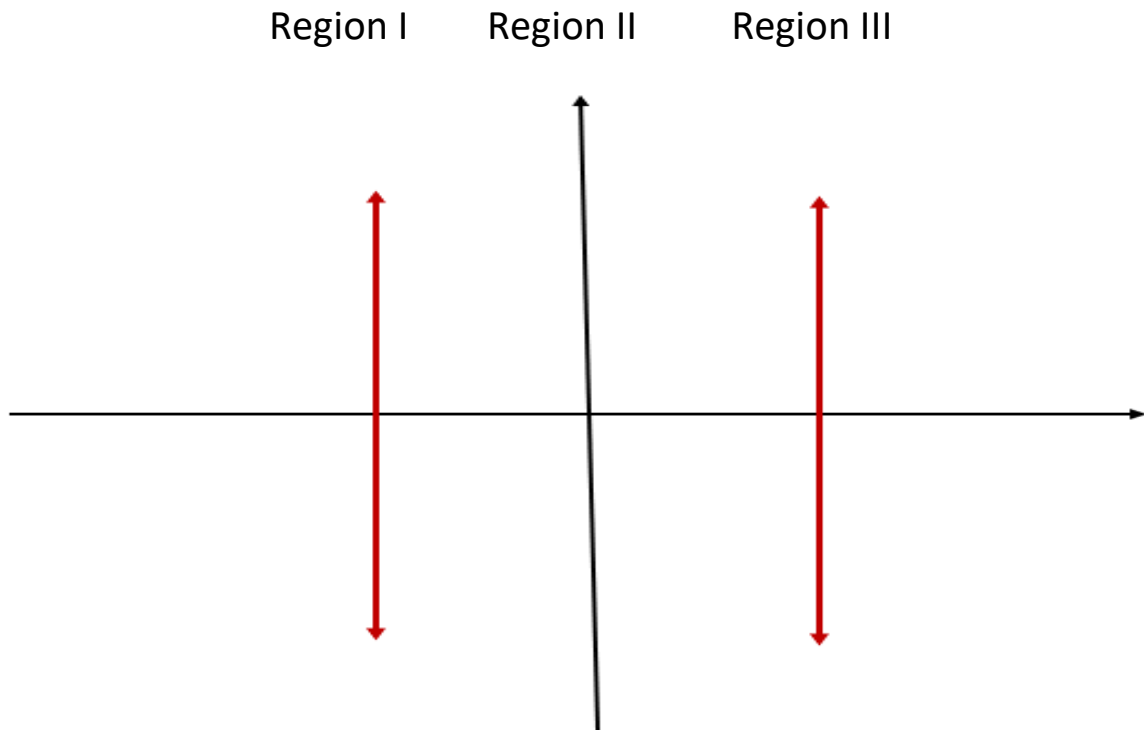


- b. Find the electric potential at $\langle 3 \text{ } \mu\text{m}, 2 \text{ } \mu\text{m}, 1 \text{ } \mu\text{m} \rangle$

- c. Find the electric field at $\langle 3 \text{ } \mu\text{m}, 2 \text{ } \mu\text{m}, 1 \text{ } \mu\text{m} \rangle$

Question 3. Consider 2 infinite sheets of charge. The sheet to the right of the origin is negatively charged. The sheet to the left of the origin is positively charged.

- Where is the electric field greatest – Region I, Region II, and/or Region III?
- Where is the electric field weakest – Region I, Region II, and/or Region III?
- Draw the electric field lines for the total electric field



Question 4. Proton-beam therapy involves firing high-energy protons at a tumor. The protons burrow into the tumor, coming to rest. The kinetic energy lost by the protons goes into the tumor, bursting its DNA, thus killing the cancerous cells. In one case, it is desired that 0.10 J of proton energy be deposited in a tumor. To create the proton beam, the protons are accelerated from rest through a 10 MV (10×10^6 V) potential difference. What is the total charge of the protons that must be fired at the tumor to deposit the required energy?

Question 5. Consider an electron entering the middle of two parallel infinite sheets with a velocity in the x-direction. The top sheet is held at a potential V_1 . The bottom sheet is held at a potential V_2 . The plates are separated by a distance h . The electron hits the top of the plate a distance d from where it entered.

- a. Draw the electric field lines between the plates (hint: which sheet does the electron hit?). Is V_1 bigger or is V_2 bigger (assuming both are positive)?



- b. What is the value of the electric field inside of the plates?

- c. What is the force on the electron due to the electric field?

- d. At what time t does the electron hit the top plate?