PHYS 205-Section 03
Electricity and Magnetism - Winter 2018
Assignment 1
Due date: Jan. 26th (Submit in class)

Instructions

You should hand in your answers, written or typed in standard letter sized papers, in class on Jan. 26th. Make sure to provide a cover sheet with the following information:
1. Your class (PHYS 205/03)
2. The sequence number of the actual assignment (for example: Assignment # 1)
3. The name of your instructor (Nima Nateghi)
4. Your name
5. Your student ID#
6. The due date.

In case of multiple pages **you should staple the pages together** properly. We are not held responsible for lost pages of home works due to inadequate grouping of pages.

In case of **late submission**, drop your assignment in the physics department's dropbox (SP building, 3rd floor). There will be a 20% late submission penalty for each day after the due date. No electronic submission will be accepted. After the answers are posted, not assignments will be accepted (under no circumstances).


Problems

1. Assume a classical hydrogen atom, in which the electron orbits the proton in a circular path due to the Coulomb's force. Taking the mass of electron to be $9 \times 10^{-31} kg$ and the radius of the orbit to be $5.2 \times 10^{-11} \ m$, calculate the speed of the electron in its orbit. (**5 points**)
   Hint: You need to know circular motion from PHYS 204.

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2. The gravitational force close to the surface of the Earth is described by $F_g = mg$, where $g = 9.8 \ m/s^2$. If we want an electron to float very close to the surface of the Earth, what should be the sign and magnitude of the charge we should place at the center of the Earth? Take the mass of electron $9 \times 10^{-31} kg$ and the radius of the Earth to be 6370 km. (**5 points**)

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3. In the figure below, the rod is uniformly charged with $\lambda = +3 \times 10^{-3}\,\frac{C}{m}$. Find the net electric field at point P. $R = 20\ cm$. (**5 points**)
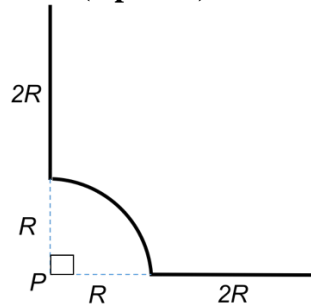
4. A point charge $q = 2 \times 10^{-3}\ C$ is placed at the center of a cube with length $a = 25\ cm$. What is the flux passing through one side? (**5 points**)

5. A point charge $q = 2 \times 10^{-3}\ C$ is placed at the corner of a cube with length $a = 25\ cm$. What is the flux passing through one side? (**5 points**)

6. The volume charge density of the hollow cylinder of length $25\ cm$, shown in the figure below, is $\rho = 4 \times 10^{-5}\,\frac{C}{m^3}$. If $a = 10\ cm$ and $b = 15\ cm$. Find the electric field at:
   a) $r = 5\ cm$ (**2 points**)
   b) $r = 12\ cm$ (**2 points**)
   c) $r = 25\ cm$ (**2 points**)