## Physics 10164 - Spring 2019 Exam 1C

Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work even if you get the right answer. <u>Clearly indicate your answer with a circle or a box</u> and remember to include correct <u>units</u> and <u>significant figures</u>.

- (35 pts) Three charges are arranged in a straight line as shown below.
- a) What is the magnitude and direction of the electric field at point X due to these charges?
- b) Assuming charge  $q_1$  is at the origin, where would  $q_2$  need to be located (what x-coordinate) so that it would feel no net electric force due to the other two charges?



2. (35 pts) Three charges are arranged at the corners of a square as shown below.

- a) What is the magnitude and direction of electric force on charge  $q_3$  due to the other two charges?
- b) How much work would be done by the electric force is charge  $q_3$  were moved from its shown location to the center of the square?



3. (30 pts) A parallel-plate capacitor has a charge of 0.25 nC on its positive plate and is connected to a 120-Volt battery. If the plate area is 24  $\rm cm^2$ ...

- a) What is the magnitude of the electric field between the plates?
- b) What is the capacitance of the capacitor?
- c) What is the separation between the plates?

The plates are disconnected from the battery, and then some applied force moves the plates further apart, doubling their separation. After the plates are moved...

- d) What is the charge on the positive plate?
- e) What is the voltage difference between the plates?
- f) What is the capacitance of the capacitor?