Physics 10164 - Exam 1A

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>.

1. (35 pts) Four charges are arranged in a rectangle as shown below. $q1 = +10 \ \mu$ C, $q2 = -20 \ \mu$ C, $q3 = -30 \ \mu$ C, $q4 = +40 \ \mu$ C. Find the magnitude and direction of the force on the charge q4. Answer with two significant figures.



2. (30 pts) A 240 gram mass with a charge of 45 μC is dropped from an altitude of 17 meters above ground level. This charge is affected only by gravity (assumed constant) and a uniform electric field in the region.

a) If the mass takes 2.8 seconds to reach the ground, determine the magnitude and direction of the electric field that the mass moves through.

b) If the voltage at ground level is zero, what is the voltage at an altitude of 17 meters above ground level?

#3. (35 pts) For the circuit shown below, determine the voltage difference across the capacitor C3.



 $C4 = 4.0 \, \mu F$