## Physics 10164 - Exam 1D

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. Clearly indicate your answer with a circle or a box and remember to include correct units and significant figures.
\#1. (40 pts) A $3.0 \mu \mathrm{C}$ charge (A) is fixed at the origin. Nearby, at a coordinate $x=2.4 \mathrm{~mm}, \mathrm{a}-5.5 \mu \mathrm{C}$ charge (B) with a mass of 320 grams is initially at rest. An applied force causes charge $B$ to move to coordinate $x=5.6 \mathrm{~mm}$, and the charge has a speed of $12 \mathrm{~m} / \mathrm{s}$ when it gets there.

Assuming only the electric force and the applied force are relevant in this problem, how much work is done by the applied force?
2. (30 pts) Three charges are located along the x-axis.
$q_{1}$ is $-6.5 \mu \mathrm{C}$ and is located at $\mathrm{x}=0$.
$q_{2}$ is $4.0 \mu \mathrm{C}$ and is located at $\mathrm{x}=63 \mathrm{~cm}$.
$q_{3}$ is $-3.4 \mu \mathrm{C}$ and is located at $\mathrm{x}=75 \mathrm{~cm}$.
Find the magnitude and direction of the electric field at the location $\mathrm{x}=41 \mathrm{~cm}$.
\#3. (30 pts) A copper wire has a resistivity of $1.7 \mathrm{x} 10^{-8}$ Ohmmeters and a power loss of 3.5 Watts/meter when it carries a 250 Amp current.
a) Assuming the wire operates at a standard temperature of $20^{\circ} \mathrm{C}$, what is the diameter of the wire?
b) If energy costs 12 cents per kilowatt-hour, how much does this power loss cost per day for a 5.0 km cable?

