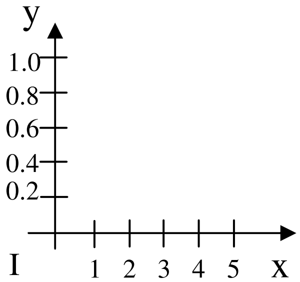
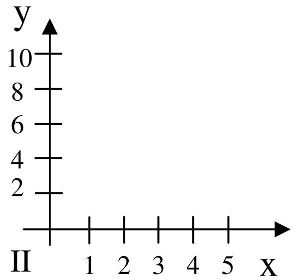
PreAP Electrostatics 15

x	y
1	1
2	0.5
3	0.333
4	0.25
5	0.2



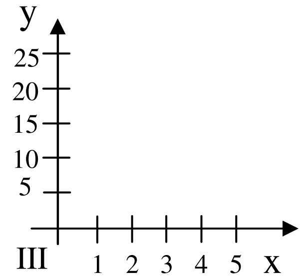
Function: ______________

x	y
1	2
2	4
3	6
4	8
5	10



Function: ______________

x	y
1	1
2	4
3	9
4	16
5	25



Function: ______________

1. Graph the data tables on the given graphs. Notice the shapes.
2. * Given the following possible functions: $y = mx + b$; $y = x^2$; $y = 1/x$; $y = \sqrt{x}$
   Look at the data tables and decide which function is which. It is can be as simple as figuring out how you get the y-values from the x-values. Write the given functions under the correct table/graph.

Q1,2: Graph I is 1/x, Graph II is linear ($y = mx$) Graph III is $y = x^2$

It turns out that $1/x^2$ looks pretty close to a 1/x graph, so put this possibility under that graph, as well.

3. Now that we remember that graph shapes, answer the following questions. Notice the equations at the left.

$$F_e = k_c \frac{q_1 q_2}{r^2} \qquad E = k_c \frac{q_1}{r^2}$$

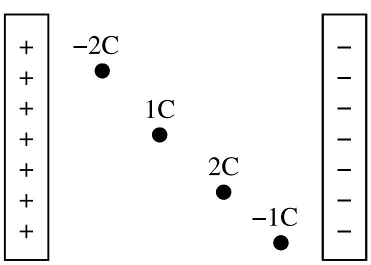
$$PE = k_c \frac{q_1 q_2}{r} \qquad V = k_c \frac{q_1}{r}$$

$$PE = \frac{1}{2}|Q|\Delta V \qquad C = \varepsilon_0 \frac{A}{d}$$

A. Which graph above (I, II, or III) would be Electric Force vs. distance (r)?
B. Which graph would be Electric Field vs. charge?
C. Which graph would be Electric Potential vs. Force?
D. In a constant electric field $\Delta PE = -qEd$. Which graph shows change of PE vs. d in a constant electric field?

3A Graph I (F ↓ as r ↑)
B..Graph II (F↑ as q↑, but linearly)
C. n/a not related
D. Graph II, linear

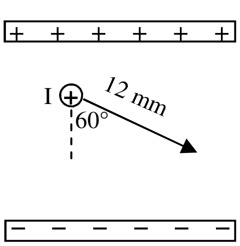
4. Four charges are between the plates of a parallel plate capacitor. Assume the charges are far from the edges.



A. Draw the electric field between the plates.
B. Which charge feels the greatest electric field?
C. Which charge feels more magnitude of force: the +2C or −2C charge?
D. Which charge has the greatest potential?
E. Write Newton's Second Law:
F. The +2C is released from rest.
   i. Which way does it go and is this with the field?
   ii. Does it move speed up, slow down, or stay at constant speed?
   iii. Does it gain or lose potential energy?
   iv. Does it gain or lose potential?
G. If released from rest, describe the motion of the −2C charge (include the above items).

A. + to −
B. Same for all (parallel E)
C. Same (opp dir)
D. −2C (closest to + plate: about posit)
E. F = ma
Fi. With E, right
Fii. Speed up
Fiii lose
Fiv. Lose (toward − plate)
G—figure it out.

5. A +3C charge is moved in a uniform electric field that has a field strength of 500 N/C.



A. Calculate the distance it moves parallel to the field.
B. Which direction does the electric field point?
C. Calculate the ΔPE of the charge.
D. Since electric field is also in V/m and the plates are separated by 18mm, calculate the voltage of the plates.
E. If this is a 6μF capacitor, how much charge is held on it?

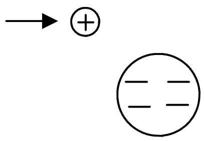
5A: 12cos60° = 6 mm
5B. Down
5C: = −qEd = −(3)(−500)(−.006) = −9 J
D. 500 V/m, so (500V/1m)(.018m) = 9V
E. (6E−6C/V)9V = 5.4E−5 C

6. A parallel plate capacitor has a capacitance of 4μF and hold 8μC of charge on one plate.
   A. What is the net charge of the capacitor?

   B. What is the stored potential energy?

6A. You should know this = 0 C (always)

6B. PE = ½QV and and a farad = C per volt. Find V first. V = 2v, so PE = 8E-6joules



7. A small positive charge is moving toward a massive negatively charge cyclotronic generator. Draw the path of the positive charge.

7. Opposites ALWAYS attract, so it will curve toward the neg charged object, whatever it is.