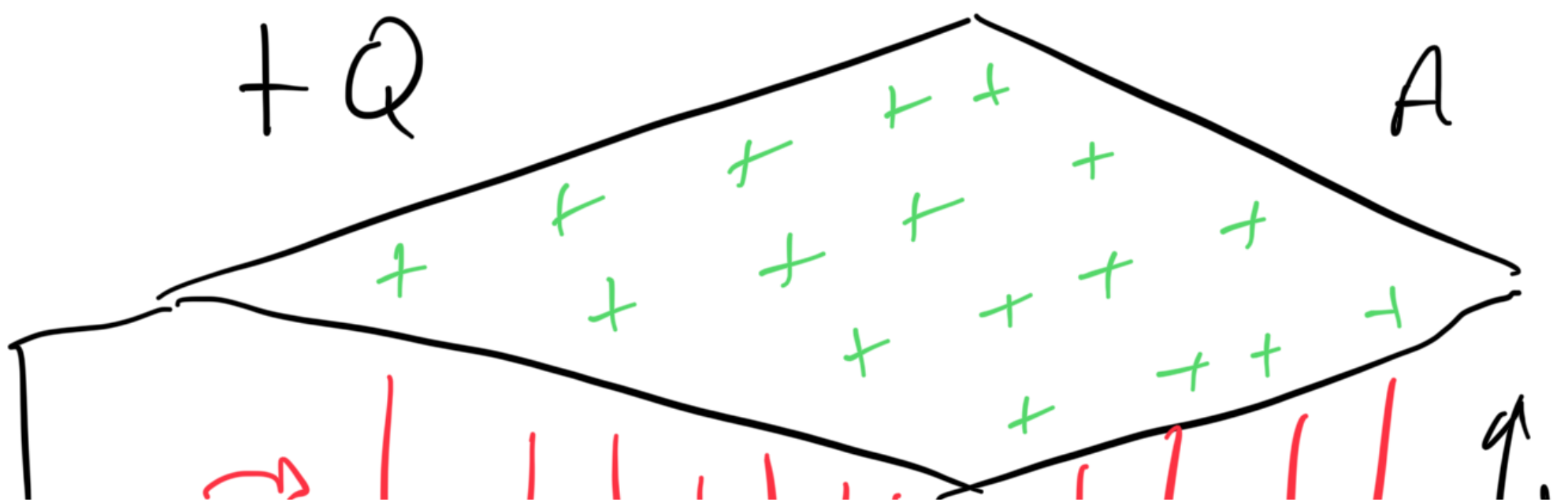
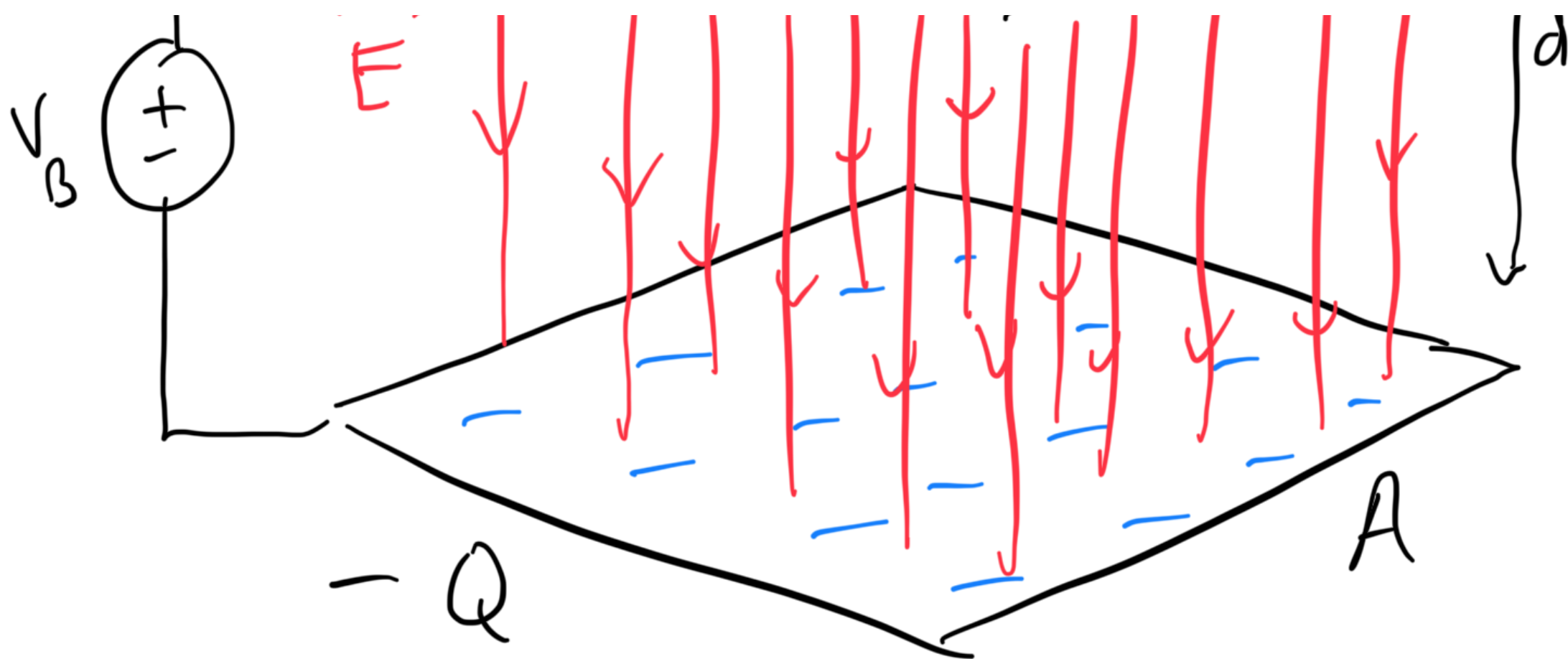


Physics 202 - Week 6.1

Midterm 1

- grades are posted on WebAssign
- Class average 70.4% (B-)
- overall class average (HW + Test)
= 76.5% (B/B+)
- I am pretty happy with those numbers !! Nice work !!

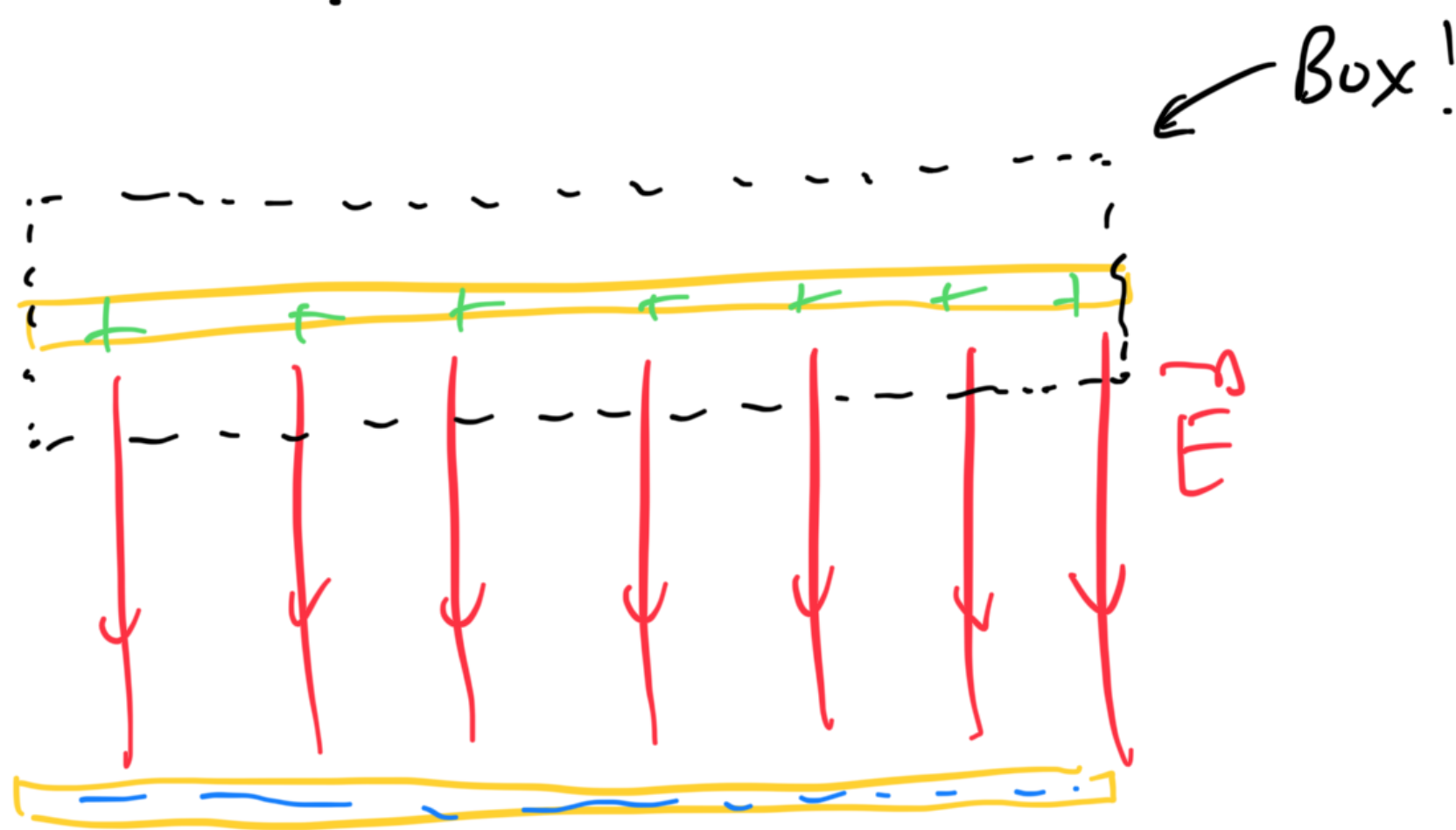




What we know: $\Delta V = |\vec{E}| \cdot d$

$$\therefore V_B = |\vec{E}| \cdot d$$

What is $|\vec{E}|$? \leftarrow Gauss's Law!!



$$\text{RHS: } \Phi_E = \frac{Q_{\text{inside}}}{\epsilon_0} = \frac{Q}{\epsilon_0}$$

$$\text{LHS: } \oint_S \vec{E} \cdot d\vec{A} = |\vec{E}| \cdot A$$

$$\oint_S \vec{E} \cdot d\vec{A} = Q_{\text{inside}} / \epsilon_0$$

$$\therefore \boxed{|\vec{E}| = \frac{Q}{\epsilon_0 A}} \quad \oint \vec{E} \cdot d\vec{A} = \frac{Q}{\epsilon_0}$$

surface

$$\therefore V_B = |\vec{E}| \cdot d$$

$$= \left(\frac{Q}{\epsilon_0 A} \right) \cdot d$$

$$\therefore \boxed{Q = \left(\frac{\epsilon_0 A}{d} \right) V_B}$$

This says that we can calculate how much charge is produced on each plate for a given battery voltage!!

What is $\frac{\epsilon_0 A}{d}$?

This is a property of the device!

We call it CAPACITANCE.

$$\boxed{C = \frac{\epsilon_0 A}{d}}$$

Hence:

$$Q = C \Delta V$$

$$[C] = \frac{[\epsilon_0] \cdot [A]}{[d]} = \frac{\frac{C^2}{N \cdot m^2} \cdot m^2}{m} = \frac{C^2}{N \cdot m} = \frac{C^2}{J/V} = C/V \text{ (Coulombs/Volt)}$$

$\equiv 1 \text{ Farad}$

(after Michael
Faraday)
