

2012 FEB 1

POTENTIAL ENERGY

COMPARE WITH GRAVITY

$$PE = mgh$$

↓ F_{GRAV}

GENERAL RELATIONSHIP:

FORCE POINTS IN THE DIRECTION OF
DECREASING POTENTIAL ENERGY

19th CENTURY (MODERN) VIEW

OF ELECTRIC ENERGY:

- ① A CHARGE CREATES AN ELECTRIC POTENTIAL.
- ② THE ELECTRIC POTENTIAL GIVES ANOTHER CHARGE ELECTRIC POTENTIAL ENERGY

ELECTRIC POTENTIAL

- SCALAR
- UNITS OF VOLTS (V)
- +/- MATTERS
- SYMBOL IS V

ELECTRIC POTENTIAL PRODUCED BY A POINT CHARGE

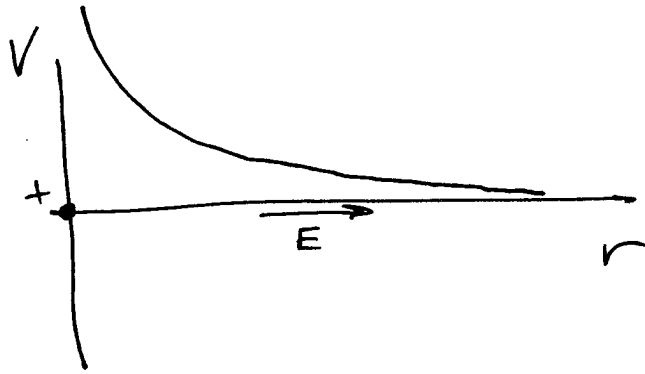
$$V = k \frac{Q}{r}$$

$9 \times 10^9 \frac{\text{Nm}^2}{\text{C}^2}$ THE POINT CHARGE
 DISTANCE FROM Q

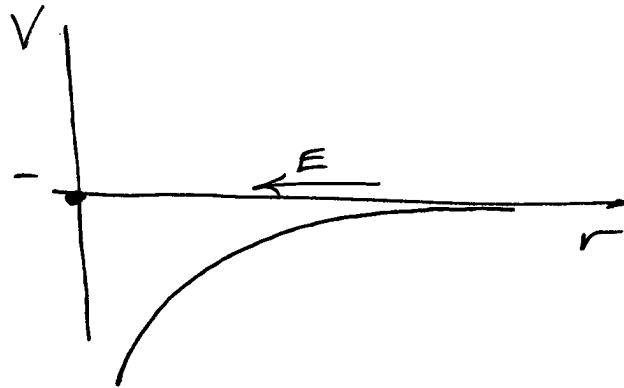
ELECTRIC POTENTIAL PRODUCED BY A PLATE OF CHARGE

$$V = -2\pi k \sigma |x|$$

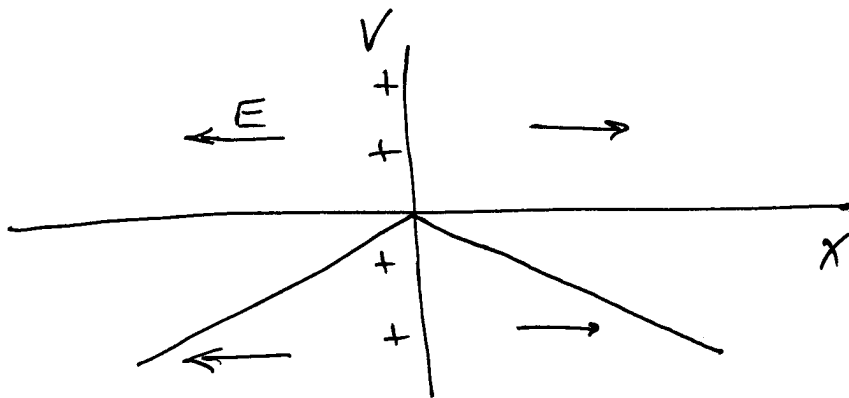
$9 \times 10^9 \frac{\text{Nm}^2}{\text{C}^2}$ SURFACE CHARGE DENSITY
 DISTANCE FROM PLATE



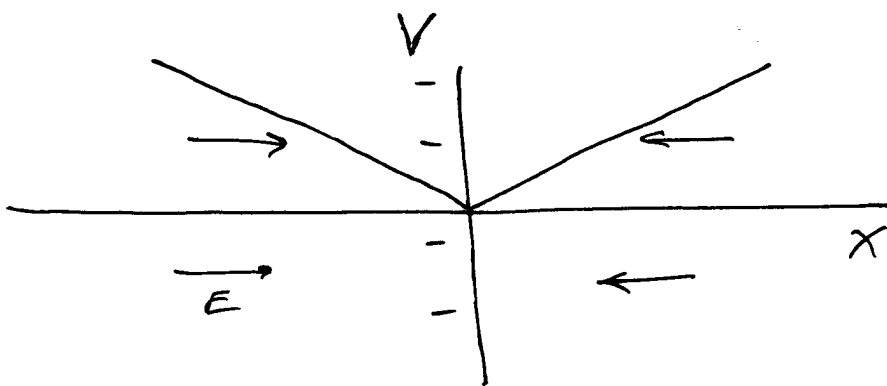
V PRODUCED BY
POINT CHARGE
 $Q > 0$



V PRODUCED BY
POINT CHARGE
 $Q < 0$



V PRODUCED BY
PLATE
 $\sigma > 0$



V PRODUCED BY
PLATE
 $\sigma < 0$

IN GENERAL,
ELECTRIC FIELD POINTS IN THE DIRECTION
OF DECREASING ELECTRIC POTENTIAL.

P.10 (ch 17, P14)

$$\begin{aligned} V &= k \frac{Q}{r} = \left(9 \times 10^9 \frac{\text{N}\cdot\text{m}^2}{\text{C}^2} \right) \frac{(4 \times 10^{-6} \text{C})}{(0.15 \text{m})} \\ &= 2.4 \times 10^5 \frac{\text{N}\cdot\text{m}}{\text{C}} \\ &= 2.4 \times 10^5 \text{ V} \end{aligned}$$

$$PE = qV$$

POTENTIAL ENERGY
OF CHARGE q SITTING IN
ELECTRIC POTENTIAL V

V IS CREATED BY OTHER CHARGES
(NOT q)