Newton's Law of G

$$\boxed{F_G = \frac{GMm}{r^2}}$$

Coulomb's Law

$$\boxed{F_E = \frac{kQq}{r^2}}$$

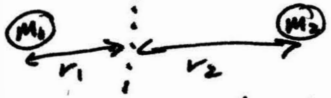
$k = \frac{1}{4\pi\varepsilon_0} = 9.0\times10^9$

"Force is proportional to product of masses/charges and inverse square of their separation."

density $\rho \propto \frac{m}{r^3}$ $\quad g \propto \frac{m}{r^2}$

$\therefore g \propto \rho r$

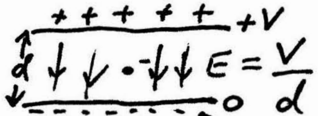
$g=0$



$\therefore \frac{\cancel{G}M_1}{r_1^2} = \frac{\cancel{G}M_2}{r_2^2}$

$F = mg$

$F = EQ$

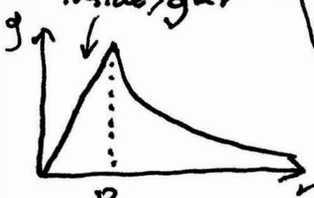


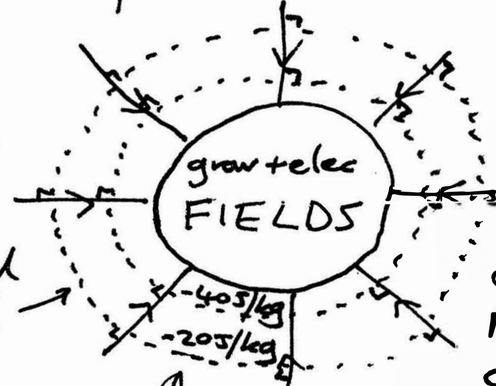
parallel plates

uniform field

$$\boxed{g = \frac{GM}{r^2}} \qquad \boxed{E = \frac{kQ}{r^2}}$$

inside, $g \propto r$





radial field

EQUIPOTENTIALS

SHOW HOW MUCH ENERGY REQD TO MOVE 1kg/1C TO ∞. DEFINITION:

"POTENTIAL IS THE WORK REQUIRED TO MOVE A UNIT MASS/CHARGE FROM ∞ TO THAT POINT"

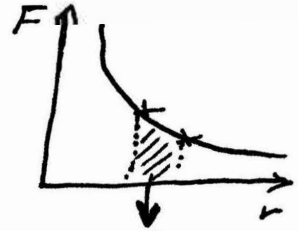
FIELD LINES

SHOW DIR OF FORCE ON (POINT) MASS/POSITIVE CHARGE.

($\therefore$ THIS WOULD BE A NEGATIVE CHARGE HERE)

CLOSER = STRONGER FIELD.

PE = Fr (work done)



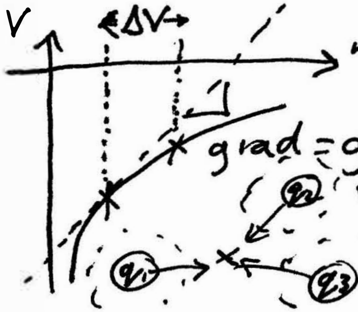
$$\boxed{E_p = \frac{GMm}{r}} \qquad \boxed{E_p = \frac{kQq}{r}}$$

∞

ESCAPE VEL

DISTANCE OF CLOSEST APPROACH

$g = \frac{\Delta V}{\Delta r}$, $E = \frac{\Delta V}{\Delta r}$ potential gradient



$V_{tot} = V_1 + V_2 + V_3$ (scalar!)

$$\boxed{V = -\frac{GM}{r}} \qquad \boxed{V = \frac{kQ}{r}}$$

"$J\,kg^{-1}$" $\qquad$ "$J\,C^{-1}$"

$\Delta E = m\Delta V$

$\Delta E = q\Delta V$

$V \neq 0$

$V = 0$

PE = KE

$\frac{GM\cancel{m}}{r} = \frac{1}{2}\cancel{m}v^2$

$\frac{kQq}{r} = \frac{1}{2}mv^2$

Video