

Please hand in PS #3
(on chair)

PS 4 coming later today

See today's NY Times
for latest exoplanet news!

FABLE: Einstein & Relativity

MORAL #1: A genius in
obscurity can
revolutionize science.

MORAL #2: ONLY if new
theory encompasses
previous theories

$\gamma = 1$
 \Rightarrow Newton
is right

MORAL #3: patent office was
key to Einstein's
thinking

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(Galison)

G.R. is a theory of gravity

Newtonian gravity

$$F_{\text{grav}} = \frac{G M_1 M_2}{D^2}$$

mass
(gravitational
mass)

$F = ma$
inertial
mass

M_1 earth
 m_2 object

substitute F_{grav} into eqn of motion

$$\frac{G M_1 m_2}{D^2} = m_2 a$$

$$\text{electrostatic } F = \frac{\text{const} \times \text{charge}_1 \times \text{charge}_2}{D^2}$$

gravity is weird because
gravitational mass
= inertial mass

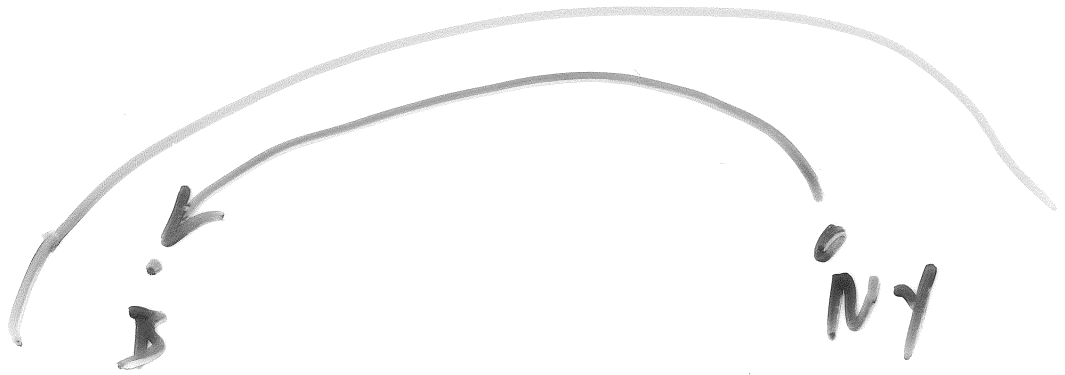
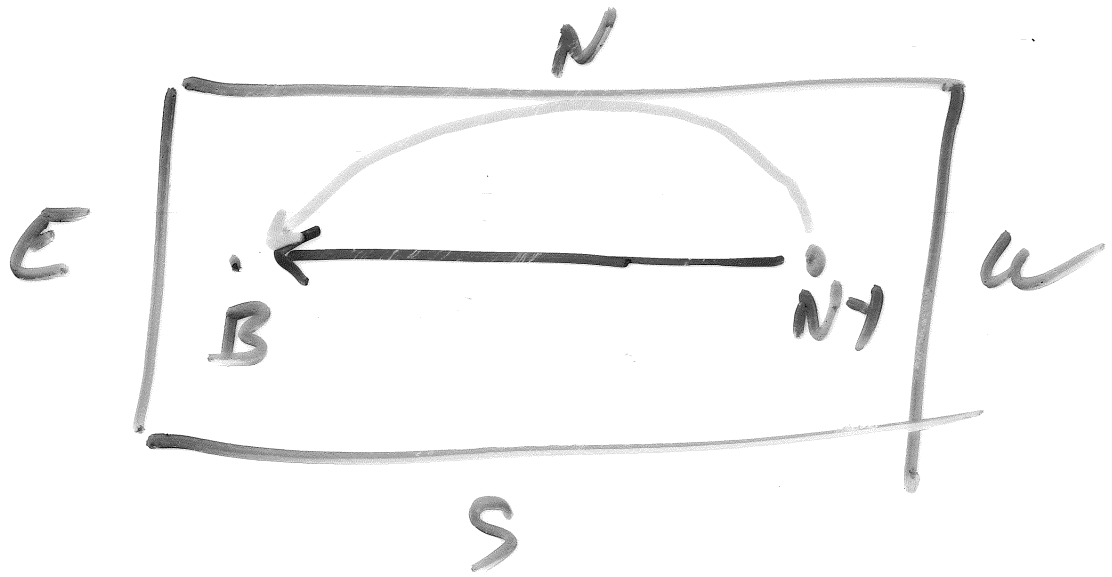
Einstein:

GRAVITY is
NOT a
force

1) objects move in
straight line in
absence of force

2) presence of mass creates
curvature in space & time

shortest distance between two
point



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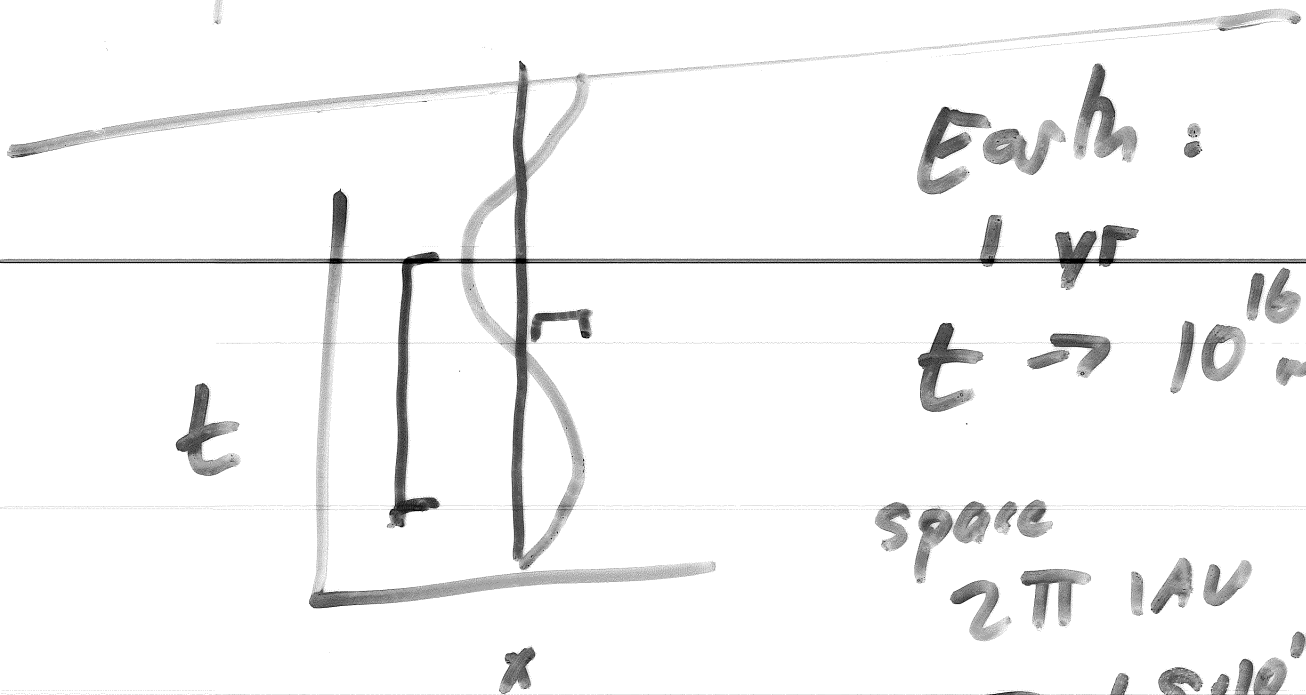
What is "space-time"

4-d coord. system

x, y, z, t

$\downarrow ct$

|| one year (time)
= 1 light year (distance)



Earth:

1 yr

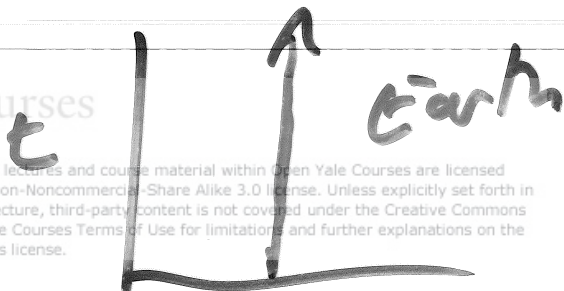
$t \rightarrow 10^{16} \text{ m}$

space

$2\pi \text{ AU}$

$2\pi \times 1.5 \times 10^{11} \text{ m}$
 $= 10^{12}$

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$R_s / R =$ how relativistic
an orbit is

\ll if $\ll 1$

\Rightarrow Newtonian
Theory

$$\frac{3 \times 10^3 \text{ m}}{1.5 \times 10^{11} \text{ m}} = 2 \times 10^{-8}$$