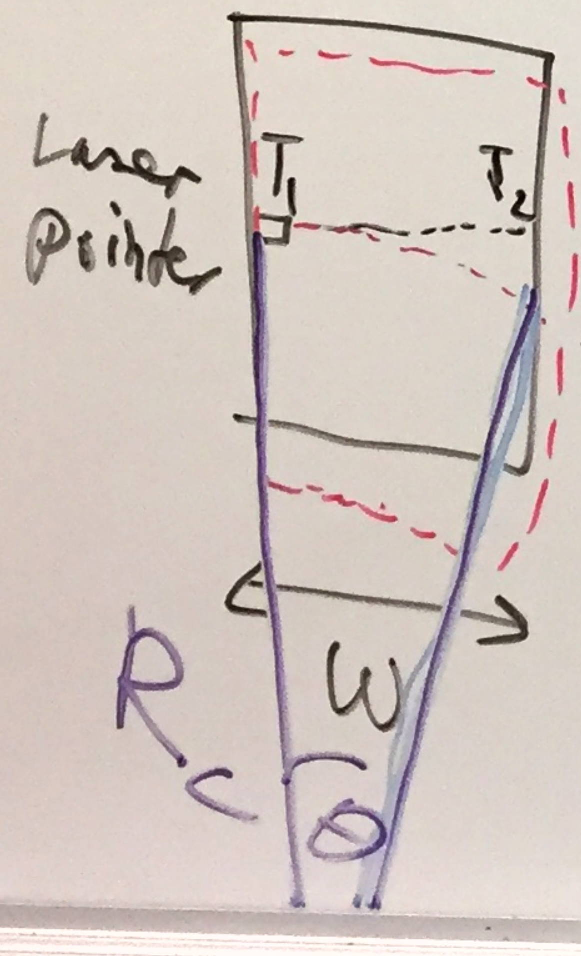
Inertial coordinate system → same laws of Physics (special relativity)

⇓ ?

→ Newton's 1st law applies

Einstein sez: locally, you can always find a "flat" coordinate system = freely falling

$$\Rightarrow g_{\mu\nu} = \begin{pmatrix} +1 & & & 0 \\ & -1 & & \\ & & -1 & \\ 0 & & & -1 \end{pmatrix}$$



$g = 9.8\,\frac{m}{s^2}$

$T_2 - T_1 = \frac{W}{c}$

$\Delta y = \frac{1}{2} g \frac{W^2}{c^2}$

$\theta \cdot R_c = W$

$\Delta y = R_c - R_c \cos\theta$

$= R_c\left(1 - \left[1 - \frac{\theta^2}{2} + \dots\right]\right)$

$= \frac{1}{2} R_c \theta^2 = \frac{1}{2} W \theta$

$$\Rightarrow \theta = \frac{gW}{c^2}$$

$g_{sun} = 270\,\frac{m}{s^2}$

Metric

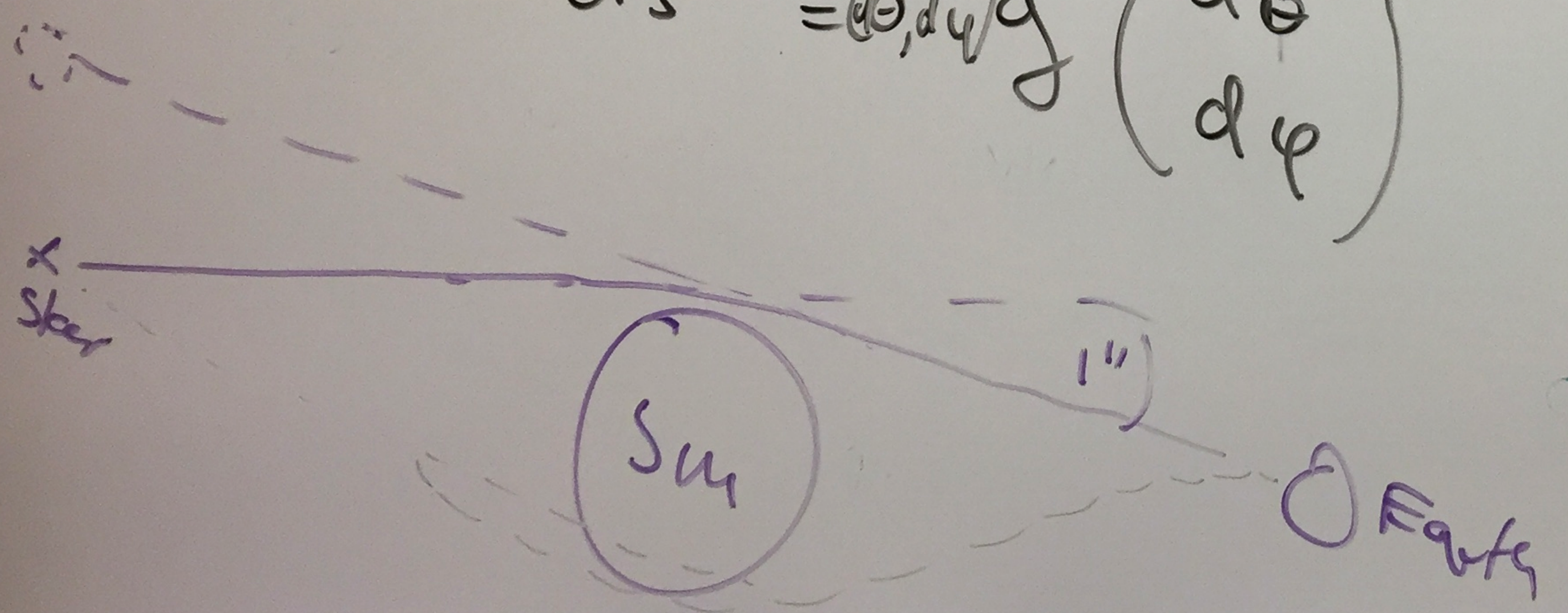
Spherical mass M

$$g_{\mu\nu} = \begin{pmatrix} \left(1 - \frac{R_s}{r}\right) & 0 & 0 & 0 \\ 0 & -\left(\frac{1}{1 - R_s/r}\right) & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix} \begin{matrix} dt \\ dr \\ \vdots \\ \vdots \end{matrix}$$

$$ds^2 = \sum_{\mu,\nu=0}^{3} x^\mu g_{\mu\nu} x^\nu$$

Surface of sphere: $g = \begin{pmatrix} R^2 & 0 \\ 0 & R^2 \sin^2\theta \end{pmatrix}$

$$ds^2 = (d\theta, d\varphi)\, g \begin{pmatrix} d\theta \\ d\varphi \end{pmatrix}$$



$$\Phi = -\frac{GM}{r}$$

$$R_s = \frac{2GM}{c^2}$$