

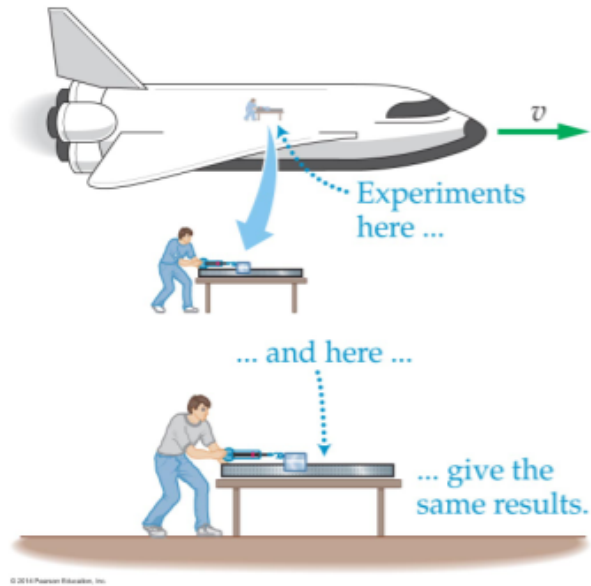
Ch 27 - Relativity

Special Relativity (no acceleration)



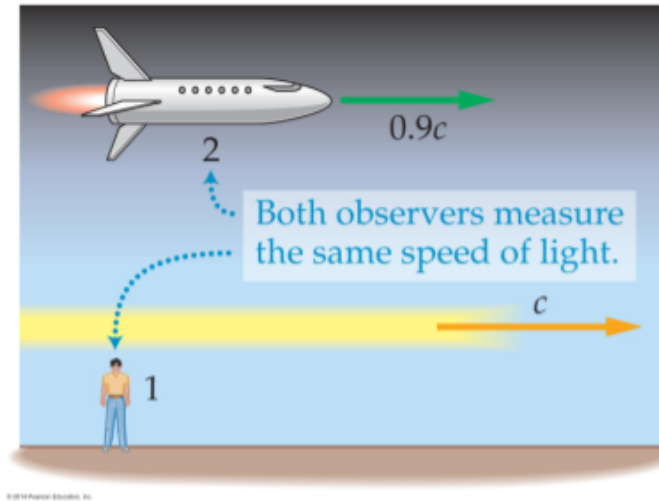
Postulates:

1. The laws of physics are the same in all inertial reference frames
2. The speed of light in a vacuum is the same for all inertial observers.



The first postulate seems intuitively obvious.

But the second postulate seems counterintuitive!



And that leads us to the following equations (after several pages of algebra).

Position:

$$X' = \frac{X-vt}{\sqrt{(1-v^2/c^2)}}$$

Time Dilation:

$$t = \frac{t_0}{\sqrt{(1-v^2/c^2)}}$$

Length Contraction:

$$L = L_0 \sqrt{(1-v^2/c^2)}$$

Mass and Energy:

$$E = mc^2$$

General Relativity applies to accelerating reference frames.

Any experiment conducted in a uniform gravitational field and in an accelerated reference frame will give identical results.

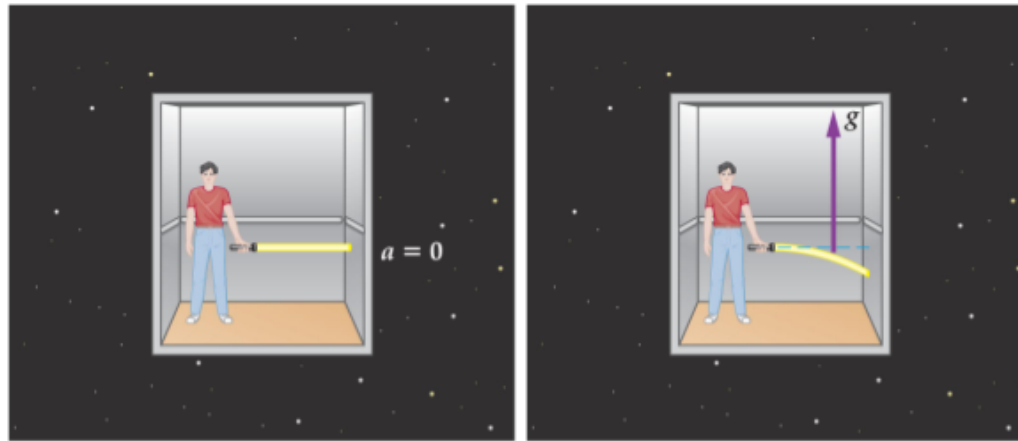


(a) A frame of reference in a gravitational field

(b) An inertial frame of reference with no gravitational field

(c) An accelerated frame of reference

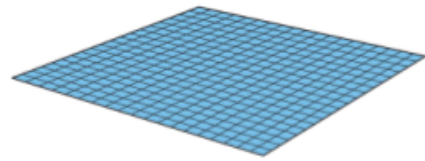
General Relativity implies that gravity bends light.



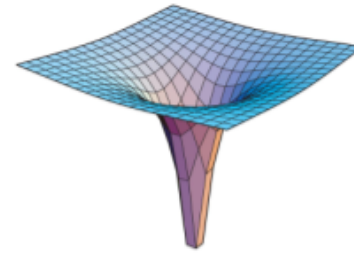
(a) Nonaccelerating elevator

(b) Accelerating elevator

It also implies that gravity warps space-time



(a) Flat space, away from massive objects



(b) Warped space, near a massive object

