Summary of Unit Two

Relativity and Synchronizing Clocks

Physics II

Special Relativity

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http://tiny.cc/RelativityAtCOA

Maxwell's Equations

- Equations that describe all of electrodynamics.
- Say that light travels at a speed of c (approx 3x10^8 m/s) without reference to any reference frame.
- Physicists assume that light propagated through the **ether**, and so the speed of light must be relative to the ether.
- Michelson and Morley fail to detect the ether.

Physics at the end of the 1800s

1. **Principle of Relativity**: laws of physics are the same in all reference frames
2. **Maxwell's Equations**. Speed of light = c.
3. **Galilean Transformations**.

- The three things cannot all be true.
- Most physicists think Maxwell's Equations need minor adjustments.
- Einstein says that the Galilean Transformation equations are wrong. Time is not absolute.

Galilean Transformations

- Relate space coordinates mea two different frame
- The primed frame ving at d of β with respect to the un-p ra
- t’ = t
- x’ = x - βt
- y’ = y
- To convert velociti
- v’ = v - β
- Think of thes tions as a “bi-li ictionary”.

Now What Now, if not Galileo?

- Einstein: The speed of light is the same in all reference frames.
- A pair of clocks in an inertial reference frame are **synchronized** if they correctly measure the speed of light to be the speed of light.
- This gives us a way to synchronize clocks.

The Radar Method

- A way to determine spacetime coordinates of an event using a single clock at the origin.
- Send light signal out at time t_A. It reflects off something and returns at time t_B. The spacetime coordinates of the reflection event E.
- $t_E = (1/2)(t_A + t_B)$
- $x_E = (1/2)(t_A - t_B)$

Spacetime Diagrams

- Super useful way to visualize events in spacetime.
- Remember that time goes up.