## NYU Physics I—the spacetime interval

- **1** Draw a spacetime diagram showing the four events  $A = (ct_A, x_A) = 0 \text{ m}, 0 \text{ m}), B = (1 \text{ m}, 1 \text{ m}), C = (1 \text{ m}, 0 \text{ m}), \text{ and } D = (0 \text{ m}, 1 \text{ m}),$
- 2 Compute all six spacetime intervals between all pairs of events.
- ${f 3}$  Now Lorentz Transform these events to a new frame using the Lorentz Transformation

$$ct' = \gamma ct - \beta \gamma x$$
  

$$x' = \gamma x - \beta \gamma ct , \qquad (1)$$

with  $\beta = (3/5)$ .

- 4 Draw a spacetime diagram of the four events in the new frame.
- **5** Re-compute all six spacetime intervals in this new frame. Which are null, which are spacelike, and which are timelike?
- 6 Now Lorentz Transform the events again using the opposite velocity, or

$$ct'' = \gamma ct' + \beta \gamma x'$$
  

$$x'' = \gamma x' + \beta \gamma ct' . (2)$$

Is everything okay?