



Case(1) and Case (2) describe the same event.

(10)

For Case(1) and Case (2) event

$$x' = \beta (x - vt)$$

$$t' = \beta (t - vx/c^2)$$

(12)

For Case(1) and Case (2) event

$$x = \beta (x' + vt')$$

$$t = \beta (t' + vx'/c^2)$$

Exchange A and B.

Case (3) is a different event from Case (1) and (2).

$$x' = \beta (\beta (x' + vt') - v \beta (t' + vx'/c^2)) = \beta^2 (1 - v^2/c^2) x'$$

$$t' = \beta (\beta (t' + vx'/c^2) - v \beta (x' + vt')/c^2) = \beta^2 (1 - v^2/c^2) t'$$

$$\beta^2 (1 - v^2/c^2) = 1$$

(13)

$$\beta = \frac{1}{\sqrt{1 - v^2/c^2}}$$