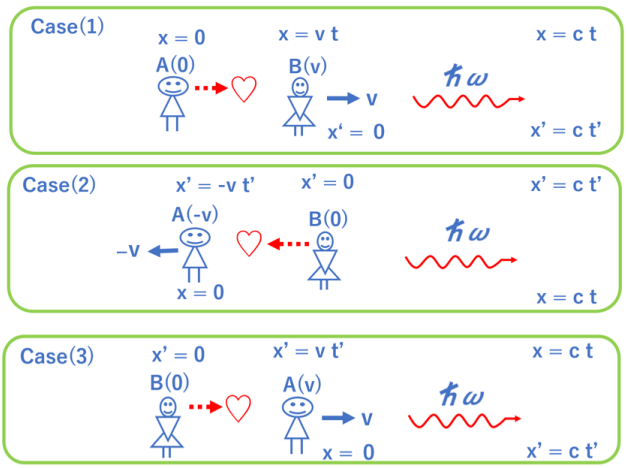
中学の数学で解ける特殊相対性理論

後は、(10)式と(12)式は同じ物理現象(even)ですので同時に連立式として成り立ち、解くことが可能です。そして (13) 式を求めることができます。 (10)式と(12)式と(13) 式を合わせてこれを　Lorentz 変換と呼んでいます。特殊相対性理論の基本的な時空間ベクトル　(t, x) の変換式となります。



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

(10)　For Case(1) and Case (2) event

$$x' = \beta\,(x - v\,t)$$
$$t' = \beta\,(t - v\,x/c^2)$$

(12)　For Case(1) and Case (2) event

$$x = \beta\,(x' + v\,t')$$
$$t = \beta\,(t' + v\,x'/c^2)$$

Exchange A and B.

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

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

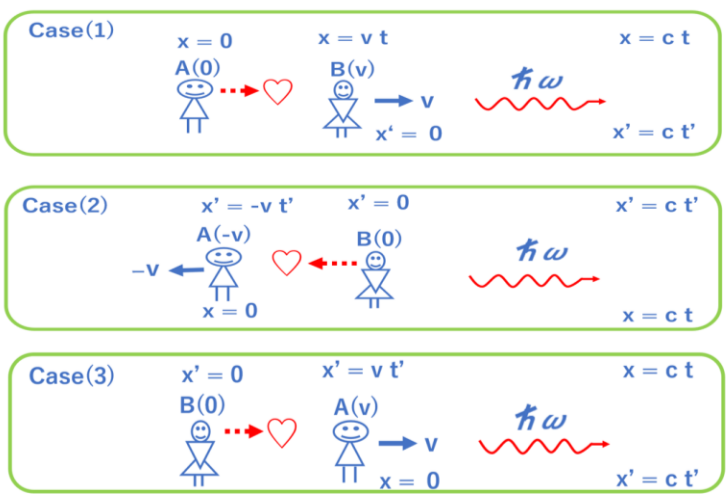
$$\beta^2\,(1 - v^2/c^2) = 1$$

(13)

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

Case(1) とCase(2)は同じEvent. Case(3)は異なる。.

Lorentz 変換



For Case(1) and Case (2) event

(10)
$$x' = \beta\,(x - v\,t)$$
$$t' = \beta\,(t - v\,x/c^2)$$

For Case(1) and Case (2) event

(12)
$$x = \beta\,(x' + v\,t')$$
$$t = \beta\,(t' + v\,x'/c^2)$$

For Case(3) event only, not valid for Case (1) and (2)

(11)
$$x' = \beta\,(x + v\,t)$$
$$t' = \beta\,(t + v\,x/c^2)$$

(13)
$$\beta = \frac{1}{\sqrt{1 - v^2/c^2}}$$