2. $y = Tx$

① $x_1^{S_0} = T_1^{S_0} x_0^{S_0} = T_1^{S_0} x_1^{S_1}$

$x_2^{S_1} = T_2^{S_1} x_1^{S_1} = T_2^{S_1} x_2^{S_2}$

$x_3^{S_2} = T_3^{S_2} x_2^{S_2} = T_3^{S_2} x_3^{S_3}$

② $T_1^{S_0} = T_1^{S_1 \to S_0}$

$T_2^{S_1} = T_2^{S_2 \to S_1}$

$T_3^{S_2} = T_3^{S_3 \to S_2}$

③ $T_1^{S_0} = T_1^{S_1 \to S_0}$

$T_2^{S_1} = T_2^{S_2 \to S_1}$

$T_3^{S_2} = T_3^{S_3 \to S_2}$

④ left $= T_1^{S_0} T_2^{S_1} T_3^{S_2} x^{S_3}$

$= T_1^{S_0} T_2^{S_1} x_3^{S_2}$

$= T_1^{S_0} x_3^{S_1}$

$= x_3^{S_0}$

⑤ $x_0^{S_0} = x_3^{S_3} \xrightarrow{T_3^{S_3 \to S_2}} x_3^{S_2} \xrightarrow{T_2^{S_2 \to S_1}} x_3^{S_1} \xrightarrow{I^{S_1 \to S_0}} x_3^{S_0}$

T Euclidean transformation (a combination of transbation and rotation)

T has two meanings:

① change of coordinate system.

② change of object

3. $T_1^{S_1} T_2^{S_1} T_3^{S_2} x_0^{S_0} = x_3^{S_0}$

proof:

① $x_0^{S_0} \xrightarrow{T_1^{S_0}} x_1^{S_0} \xrightarrow{T_2^{S_1}} x_2^{S_0} \xrightarrow{T_3^{S_2}} x_3^{S_0}$

1.

$M(RST)$

$= M((RS)T)$

$= M(RS)M(T)$

$= M(R)M(S)M(T)$

(10.4) of book: linear algebra done right, 3rd Edition

$M(T_{U \to V})$

$= M\left((I_{W \to V})(T_{W \to W})(I_{U \to W})\right)$

$= M(I_{W \to V}) M(T_{W \to W}) M(I_{U \to W})$

(change of basis formula)

(10.7) of book lodr.