7) $(2,-1,1)\ t_1\ (1,0,0)$ $\quad$ $(1,1,0)$
$(1,2,4)\ \rightleftarrows\ (0,1,0)\ \xrightarrow{t_2}\ (1,3,1)$
$(3,3,2)\ t_1^{-1}\ (0,0,1)$ $\quad$ $(1,-1,2)$
$(4,0,-1)$ $\quad$ $(1,1,1)$ $\quad$ $(2,-2,1)$

$t_1: \begin{pmatrix} 2a & b & 3c \\ -a & 2b & 3c \\ a & 4b & 2c \end{pmatrix}\begin{pmatrix}1\\1\\1\end{pmatrix} = \begin{pmatrix}4\\0\\-1\end{pmatrix} \Rightarrow$

$2a+b+3c=4$ ①
$-a+2b+3c=0$ ②
$a+4b+2c=-1$ ③

② + ③ $\quad$ ① + 2×②

$6b+5c=-1$ $\quad$ $5b+9c=4$

$b=(-1-5c)/6$

sub $b=(-1-5c)/6$ into $5b+9c=4$

$5(-1-5c)/6+9c=4$

$-5-25c+54c=24 \Rightarrow c=1$

and $b=(-1-5c)/6=(-1-5)/6=-1$

from ② $a=2b+3c=-2+3=1$

$t_1=\begin{pmatrix}2&-1&3\\-1&-2&3\\1&-4&2\end{pmatrix}$

To find t_1^{-1}

$\left(\begin{array}{ccc|ccc}2&-1&3&1&0&0\\-1&-2&3&0&1&0\\1&-4&2&0&0&1\end{array}\right) \equiv \left(\begin{array}{ccc|ccc}1&-1/2&3/2&1/2&0&0\\-1&-2&3&0&1&0\\1&-4&2&0&0&1\end{array}\right) \equiv \left(\begin{array}{ccc|ccc}1&-1/2&3/2&1/2&0&0\\0&-5/2&9/2&1/2&1&0\\0&-7/2&1/2&-1/2&0&1\end{array}\right)$

$\equiv \left(\begin{array}{ccc|ccc}1&-1/2&3/2&1/2&0&0\\0&1&-9/5&-1/5&-2/5&0\\0&7/2&-a&1/2&0&-1\end{array}\right) \equiv \left(\begin{array}{ccc|ccc}1&0&3/5&2/5&-1/5&0\\0&1&-9/5&-1/5&-2/5&0\\0&0&29/5&6/5&7/5&-1\end{array}\right) \equiv \left(\begin{array}{ccc|ccc}1&0&3/5&2/5&-1/5&0\\0&1&-9/5&-1/5&-2/5&0\\0&0&1&6/29&7/29&-5/29\end{array}\right)$

$\equiv \left(\begin{array}{ccc|ccc}1&0&0&8/29&-10/29&3/29\\0&1&0&5/29&1/29&-9/29\\0&0&1&6/29&7/29&-5/29\end{array}\right)$

$t_1^{-1}=\frac{1}{29}\begin{pmatrix}8&-10&3\\5&1&-9\\6&7&-5\end{pmatrix}$