

To find  $t_2$

$$\begin{pmatrix} a & b & c \\ a & 3b & -c \\ 0 & b & 2c \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} = \begin{pmatrix} 2 \\ -2 \\ 1 \end{pmatrix} \Rightarrow \begin{aligned} a+b+c &= 2 & (1) \\ a+3b-c &= -2 & (2) \\ b+2c &= 1 & (3) \end{aligned}$$

$$(2) - (1) \\ 2b - 2c = -4$$

$$(2) - (1) + (3)$$

$$3b = -3 \Rightarrow b = -1$$

$$c = (1 - b)/2 = 1$$

$$\text{from (1)} \quad a = 2 - b - c = 2 + 1 - 1 = 2$$

$$t_2 = \begin{pmatrix} 2 & -1 & 1 \\ 2 & -3 & -1 \\ 0 & -1 & 2 \end{pmatrix}$$

$$t_2 \circ t_1 = \begin{pmatrix} 2 & -1 & 1 \\ 2 & -3 & -1 \\ 0 & -1 & 2 \end{pmatrix} \begin{pmatrix} 8 & -10 & 3 \\ 5 & 1 & -9 \\ 6 & 7 & -5 \end{pmatrix} / 29 = \frac{1}{29} \begin{pmatrix} 17 & -14 & 10 \\ -5 & -30 & 38 \\ 7 & 13 & -1 \end{pmatrix}$$

$$t_2 = \frac{1}{29} \begin{pmatrix} 17 & -14 & 10 \\ -5 & -30 & 38 \\ 7 & 13 & -1 \end{pmatrix} \quad \checkmark \quad \left[ \begin{array}{l} \text{You may omit } \frac{1}{29} \text{ by} \\ \text{value of homogeneous} \\ \text{coordinates} \end{array} \right]$$

Check

$$\frac{1}{29} \begin{pmatrix} 17 & -14 & 10 \\ -5 & -30 & 38 \\ 7 & 13 & -1 \end{pmatrix} \begin{pmatrix} 3 \\ 3 \\ 2 \end{pmatrix} = \frac{1}{29} \begin{pmatrix} 29 \\ -29 \\ 58 \end{pmatrix} = \begin{pmatrix} 1 \\ -1 \\ 2 \end{pmatrix}$$

$$\frac{1}{29} \begin{pmatrix} 17 & -14 & 10 \\ -5 & -30 & 38 \\ 7 & 13 & -1 \end{pmatrix} \begin{pmatrix} 4 \\ 0 \\ -1 \end{pmatrix} = \frac{1}{29} \begin{pmatrix} 58 \\ -58 \\ 29 \end{pmatrix} = \begin{pmatrix} 2 \\ -2 \\ 1 \end{pmatrix}$$

$$\left( \frac{4}{0}{-1} \right)$$