$= x(-1) - y(1) + z(2-a+a)$

$= -x - y + 2z = 0$ or $x + y - 2z = 0$.

e) $(1,1,1)$ is a solution of $x+y-2z=0$ hence line pass through it.

To find the cross ratio $(ABCU)$

$A(1, -1, 0)$ $\quad B(2a-1, 1, a)$

$C(a, 2-a, 1)$ $\quad U(1, 1, 1)$

solve $C = \alpha A + \beta B$

$$\begin{pmatrix} a \\ 2-a \\ 1 \end{pmatrix} = \alpha \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix} + \beta \begin{pmatrix} 2a-1 \\ 1 \\ a \end{pmatrix}$$

$a = \alpha + \beta(2a-1)$ (1)

$2-a = -\alpha + \beta$ (2)

$1 = a\beta$ (3)

From (3) $\beta = 1/a$

Sub $\beta = 1/a$ into (2), $\alpha = \beta - 2 + a$

$= 1/a - 2 + a = (a^2 - 2a + 1)/a$.

check from (1) $\alpha = a - \beta(2a-1)$

$= a - (2a-1)/a$

$= (a^2 - 2a + 1)/a$.

solve $U = \gamma A + \delta B$

$$\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} = \gamma \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix} + \delta \begin{pmatrix} 2a-1 \\ 1 \\ a \end{pmatrix}$$

$1 = \gamma + \delta(2a-1)$ (1)

$1 = -\gamma + \delta$ (2)

$1 = a\delta$ (3)

From (3) $\delta = 1/a$

Sub $\delta = 1/a$ into (2)

$1 = -\gamma + 1/a \Rightarrow \gamma = 1/a - 1 = (1-a)/a$

check from (1) $\gamma = 1 - \delta(2a-1)$

$= 1 - (2a-1)/a = (a - 2a + 1)/a$

$= (1-a)/a$.