

$$9. \quad \vec{r}(u,v) = \underbrace{(9u+v)}_x \vec{i} + \underbrace{(u-v)}_y \vec{j} + \underbrace{v}_z \vec{k} \quad (3, -3, 3)$$

$x_0 \quad y_0 \quad z_0$

$$\textcircled{1} \quad 9u+v = x \quad u-v = y \quad v = z$$

$$9u+v = 3 \quad u-v = -3 \quad \underline{\underline{v = 3}}$$

$$u - 3 = -3$$

$$u = -3 + 3$$

$$u = 0$$

$$\textcircled{2} \quad \begin{matrix} u=0 & v=3 \\ \vec{r}_u = 9\vec{i} + \vec{j} + 0\vec{k} \\ \vec{r}_v = \vec{i} - \vec{j} + 1\vec{k} \end{matrix}$$

$$\textcircled{3} \quad \vec{r}_u \times \vec{r}_v = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 9 & 1 & 0 \\ 1 & -1 & 1 \end{vmatrix}$$

$$= \vec{i} \begin{vmatrix} 1 & 0 \\ -1 & 1 \end{vmatrix} - \vec{j} \begin{vmatrix} 9 & 0 \\ 1 & 1 \end{vmatrix} + \vec{k} \begin{vmatrix} 9 & 1 \\ 1 & -1 \end{vmatrix}$$

$$= 1\vec{i} - 9\vec{j} - 10\vec{k}$$

$$\textcircled{4} \quad \underbrace{1}_a \vec{i} - \underbrace{9}_b \vec{j} - \underbrace{10}_c \vec{k}$$

$$\textcircled{5} \quad a(x-x_0) + b(y-y_0) + c(z-z_0) = 0$$

$$1(x-3) - 9(y-(-3)) - 10(z-3) = 0$$

$$(x-3) - 9(y+3) - 10(z-3) = 0$$

$$(3, -3, 3)$$

$x_0 \quad y_0 \quad z_0$