

I (1)  $z = x^2 + xy + 2y^2$  ㉔

$$z_x = 2x + y, \quad z_y = x + 4y.$$

㉕  $z_x(0, 1) = 1, \quad z_y(0, 1) = 4$  ㉔ ㉕ ㉖ ㉗ ㉘ ㉙ ㉚ ㉛ ㉜ ㉝ ㉞ ㉟ ㊱ ㊲ ㊳ ㊴ ㊵ ㊶ ㊷ ㊸ ㊹ ㊺ ㊻ ㊼ ㊽ ㊾ ㊿

$$z = x + 4(y - 1) + 2$$

(2)  $z = xy + 3x + 3y - 1$  ㉔

$$z_x = y + 3, \quad z_y = x + 3$$

㉕  $z_x(0, 0) = 3, \quad z_y(0, 0) = 3$  ㉔ ㉕ ㉖ ㉗ ㉘ ㉙ ㉚ ㉛ ㉜ ㉝ ㉞ ㉟ ㊱ ㊲ ㊳ ㊴ ㊵ ㊶ ㊷ ㊸ ㊹ ㊺ ㊻ ㊼ ㊽ ㊾ ㊿

$$z = 3x + 3y - 1$$

II 
$$\begin{pmatrix} \cos \alpha & \sin \alpha \\ \sin \alpha & -\cos \alpha \end{pmatrix} \begin{pmatrix} \cos \alpha & \sin \alpha \\ \sin \alpha & -\cos \alpha \end{pmatrix}$$

$$= \begin{pmatrix} \cos^2 \alpha + \sin^2 \alpha & 0 \\ 0 & \sin^2 \alpha + \cos^2 \alpha \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = I_2$$

III 
$$\begin{vmatrix} 1 & 2 \\ 4 & 3 \end{vmatrix} = -5 \quad \text{㉔ ㉕} \quad \begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix}^{-1} = -\frac{1}{5} \begin{pmatrix} 3 & -2 \\ -4 & 1 \end{pmatrix}$$

$$\begin{vmatrix} 5 & 2 \\ 2 & 2 \end{vmatrix} = 6 \quad \text{㉔ ㉕} \quad \begin{pmatrix} 5 & 2 \\ 2 & 2 \end{pmatrix}^{-1} = \frac{1}{6} \begin{pmatrix} 2 & -2 \\ -2 & 5 \end{pmatrix}$$