

$$3. f(x,y) = x^2 - 3y + y^2 \quad (3, 1, 7)$$

$$z = x^2 - 3y + y^2$$

$$x_0 \quad y_0 \quad z_0$$

$$z - x^2 + 3y - y^2 = 0$$

$f$                        $z \text{ error}$

①  $f_x = -2x$                       ②  $f_x = -2(3) = -6$

$f_y = 3 - 2y$                        $f_y = 3 - 2(1) = 1$

$f_z = 1$                                        $f_z = 1$

③  $f_x(x-x_0) + f_y(y-y_0) + f_z(z-z_0) = 0$

$$-6(x-3) + 1(y-1) + 1(z-7) = 0$$

$$-6x + 18 + y - 1 + z - 7 = 0$$

$$\boxed{-6x + y + z + 10 = 0}$$

$$z = 6x - y - 10$$

4.  $f(x,y) = e^{3x-2y}$                        $(2, 3, 1)$

$$z = e^{3x-2y}$$

$$x_0 \quad y_0 \quad z_0$$

$$z - e^{3x-2y} = 0$$

①  $f_x = -e^{3x-2y} \cdot 3 = -3e^{3x-2y}$

$f_y = -e^{3x-2y} \cdot (-2) = 2e^{3x-2y}$

$f_z = 1$

②  $f_x = -3e^{3(2)-2(3)} = -3$

$f_y = 2e^{3(2)-2(3)} = 2$

$f_z = 1$

③  $f_x(x-x_0) + f_y(y-y_0) + f_z(z-z_0) = 0$

$$-3(x-2) + 2(y-3) + 1(z-1) = 0$$

$$-3x + 6 + 2y - 6 + z - 1 = 0$$

$$\boxed{-3x + 2y + z - 1 = 0}$$