NMIT Serie 11

2a)

$f_1 = 5x_1x_2 \qquad \frac{df_1}{x_1} = 5x_2 \qquad \frac{df_2}{x_2} = 5x_1$

$f_2 = x_1^2x_2^2 + x_1 + 2x_2$

$\frac{df_2}{x_1} = 2x_1x_2^2 + 1 \qquad \frac{df_2}{x_2} = 2x_2x_1^2 + 2$

$$Df(x_1, x_2) = \begin{pmatrix} 5x_2 & 5x_1 \\ 2x_1x_2^2+1 & 2x_1^2x_2+2 \end{pmatrix}$$

$$Df(1,2) = \underline{\begin{pmatrix} 10 & 5 \\ 9 & 6 \end{pmatrix}}$$

2b)

$$f_1 = \ln(x_1^2 + x_2^2) + x_3^2$$

$$\frac{df_1}{x_1} = \frac{2x_1}{x_2^2 + x_1^2} \qquad \frac{df_1}{x_2} = \frac{2x_2}{x_1^2 + x_2^2} \qquad \frac{df_1}{x_3} = 2x_3$$

$$f_2 = e^{(x_2^2 + x_3^2)} + x_1^2$$

$$\frac{df_2}{x_1} = 2x_1 \qquad \frac{df_2}{x_2} = 2x_2 \cdot e^{(x_2^2 + x_2^2)}$$

$$\frac{df^2}{x_3} = 2x_3 \cdot e^{(x_3^2 + x_3^2)}$$

$$f_3 = \frac{1}{x_3^2 + x_1^2} + x_2^2$$

$$\frac{df_3}{x_1} = -\frac{2x_1}{(x_3^2 + x_1^2)^2} \qquad \frac{df_3}{x_2} = 2x_2$$

$$\frac{df_3}{x_3} = \frac{-2x_3}{(x_1^2 + x_3^2)^2}$$

$$Df(1,2,3) = \begin{pmatrix} 2/5 & \frac{4}{5} & 6 \\ \frac{2}{bc} & 4e^{BB} & 6e^{BB} \\ \frac{-2}{bc} & 4 & \frac{-6}{100} \end{pmatrix}$$