1. Write a fortran 90

2. $f(x) = e^{-x} - \sin(x)$ on $[0, 2]$

(a) 이분법

① $P_0 = 0$, $P_1 = 2$ $\quad f(P_0) = 1$, $f(P_1) = -0.9739$

$P_2 = \frac{0+2}{2} = 1$ $\quad f(P_2) = -0.4736$

② $f(P_0) f(P_2) < 0 \Rightarrow [0, 1]$

$P_3 = \frac{0+1}{2} = 0.5$ $\quad f(P_3) = 0.1271$

③ $f(P_0) f(P_3) > 0 \Rightarrow [0.5, 1]$

$P_4 = \frac{0.5+1}{2} = 0.75$ $\quad \boxed{0.75}$

(b) 뉴턴방법

$x_0 = 0.75$ $\quad f'(x) = -e^{-x} - \cos(x)$

$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} = 0.75 -$

$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} =$

3. $\begin{cases} x-y+1=0 \\ x^2+y^2-4=0 \end{cases}$ $(0.7,\ 1.7)$

$$x_1 = x_0 - J^{-1}F(x_0)$$

$$x_0 = \begin{pmatrix} 0.7 \\ 1.7 \end{pmatrix} \qquad F(x_0) = \begin{vmatrix} 0 \\ 0.7^2+1.7^2-4 \end{vmatrix} = \begin{pmatrix} 0 \\ 0.62 \end{pmatrix}$$

$$J = \begin{vmatrix} 1 & -1 \\ 2x & 2y \end{vmatrix} \qquad J^{-1} = \frac{1}{2y+2x}\begin{vmatrix} 2y & -2x \\ 1 & 1 \end{vmatrix}$$

$$= 0.20833\begin{vmatrix} 3.4 & -1.4 \\ 1 & 1 \end{vmatrix}$$

$$\therefore x_1 = \begin{pmatrix} 0.7 \\ 1.7 \end{pmatrix} - 0.20833\begin{vmatrix} 3.4 & -1.4 \\ 1 & 1 \end{vmatrix}\begin{pmatrix} 0 \\ 0.62 \end{pmatrix}$$

$$= \begin{pmatrix} 0.7 \\ 1.7 \end{pmatrix} - 0.20833\begin{pmatrix} -0.868 \\ 0.62 \end{pmatrix} = \begin{pmatrix} 0.88083 \\ 1.57084 \end{pmatrix}$$