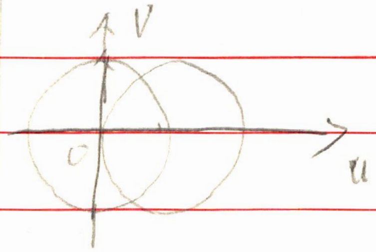
P122 2.7

2(a) $DF(x)=\begin{bmatrix} e^{u+2v} & 2e^{u+2v} \\ \cos(u+v) & \cos(u+v)\end{bmatrix}$ $DF(x_0)=\begin{bmatrix}1&2\\1&1\end{bmatrix}$

$$F(x)=F(x_0)+DF(x_0)\cdot(x-x_0)+O(x-x_0)^2=\begin{bmatrix}1\\0\end{bmatrix}+\begin{bmatrix}1&2\\1&1\end{bmatrix}\begin{bmatrix}u\\v\end{bmatrix}+O(x^2)$$

3(a) $\begin{cases}u^2+v^2=1\\(u-1)^2+v^2=1\end{cases} \Rightarrow \begin{cases}u=\frac{1}{2}\\v=\pm\frac{\sqrt{3}}{2}\end{cases}$



4(a) $F(x)=\begin{bmatrix}u^2+v^2-1\\(u-1)^2+v^2-1\end{bmatrix}$, $DF(x)=\begin{bmatrix}2u & 2v\\2u-2 & 2v\end{bmatrix}$, $DF^{-1}(x)=\begin{bmatrix}\frac{1}{2} & -\frac{1}{2}\\ \frac{1-u}{2v} & \frac{u}{2v}\end{bmatrix}$

$$x_1=x_0-DF^{-1}(x_0)F(x_0)=\begin{bmatrix}1\\1\end{bmatrix}-\begin{bmatrix}\frac{1}{2}&-\frac{1}{2}\\0&\frac{1}{2}\end{bmatrix}\begin{bmatrix}1\\0\end{bmatrix}=\begin{bmatrix}\frac{1}{2}\\1\end{bmatrix}$$

$$x_2=x_1-DF^{-1}(x_1)F(x_1)=\begin{bmatrix}\frac{1}{2}\\1\end{bmatrix}-\begin{bmatrix}\frac{1}{2}&-\frac{1}{2}\\\frac{1}{4}&\frac{1}{4}\end{bmatrix}\begin{bmatrix}\frac{1}{4}\\\frac{1}{4}\end{bmatrix}=\begin{bmatrix}\frac{1}{2}\\\frac{7}{8}\end{bmatrix}$$

5(a) $x_1=x_0-A_0^{-1}F(x_0)=\begin{bmatrix}1\\1\end{bmatrix}-\begin{bmatrix}1&0\\0&1\end{bmatrix}\begin{bmatrix}1\\0\end{bmatrix}=\begin{bmatrix}0\\1\end{bmatrix}$

$$A_1=A_0+\frac{[F(x_1)-F(x_0)-A_0(x_1-x_0)](x_1-x_0)^T}{(x_1-x_0)^T(x_1-x_0)}=\begin{bmatrix}1&0\\-1&1\end{bmatrix}$$

$$x_2=x_1-A_1^{-1}F(x_1)=\begin{bmatrix}0\\1\end{bmatrix}-\begin{bmatrix}1&0\\1&1\end{bmatrix}\begin{bmatrix}0\\1\end{bmatrix}=\begin{bmatrix}0\\0\end{bmatrix}$$

$$A_2=A_1+\frac{[F(x_2)-F(x_1)-A_1(x_2-x_1)](x_2-x_1)^T}{(x_2-x_1)^T(x_2-x_1)}=\begin{bmatrix}1&1\\-1&1\end{bmatrix}$$

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6(a) $X_1 = X_0 - B_0 F(X_0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix} - \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

$$B_1 = B_0 + \frac{[X_1 - X_0 - B_0(F(X_1) - F(X_0))](X_1 - X_0)^T B_0}{(X_1 - X_0)^T B_0 [F(X_1) - F(X_0)]} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$$

$$X_2 = X_1 - B_1 F(X_1) = \begin{bmatrix} 0 \\ 1 \end{bmatrix} - \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$$B_2 = B_1 + \frac{[X_2 - X_1 - B_1(F(X_2) - F(X_1))](X_2 - X_1)^T B_1}{(X_2 - X_1)^T B_1 [F(X_2) - F(X_1)]} = \begin{bmatrix} \frac{1}{2} & -\frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} \end{bmatrix}$$