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▶ 원본의 우편 및 택배발송 : TEL. 019-685-0882, 054-776-0881 경북 경주시 동천동 880-1 한일아트빌라 102 호 임병덕 우편번호: 780-933

Now, let's consider $Q\angle R$ test statistic.

Note that

$$Q_n(\theta) = Q_n\left(\dot{\theta}\right) + \nabla_\theta Q_n\left(\dot{\theta}\right)\left(\theta - \dot{\theta}\right) + \frac{1}{2}\left(\theta - \dot{\theta}\right)' \nabla_\theta{}^2 Q_n\left(\ddot{\theta}\right)\left(\theta - \dot{\theta}\right)$$

For some $\ddot{\theta}$ between θ and $\dot{\theta}$,

Now, let $\dot{\theta}$ be $\hat{\theta}_n$ and θ be $\tilde{\theta}_n$.

Then $Q_n\left(\tilde{\theta}_n\right) = Q_n\left(\hat{\theta}_n\right) + \nabla_\theta Q_n\left(\hat{\theta}_n\right)\left(\tilde{\theta}_n - \hat{\theta}_n\right) + \frac{1}{2}\left(\tilde{\theta}_n - \hat{\theta}_n\right)' \cdot \nabla_\theta{}^2 Q_n\left(\bar{\theta}\right)\left(\tilde{\theta}_n - \hat{\theta}_n\right)$

For some $\bar{\theta}_n$ between $\tilde{\theta}_n$ and $\hat{\theta}_n$.

Further, we note that from the definition of $\hat{\theta}_n, \nabla_\theta Q_n\left(\hat{\theta}_n\right) \equiv 0$. This implies that

$$2\left(Q_n\left(\tilde{\theta}_n\right) - Q_n\left(\hat{\theta}_n\right)\right) = \left(\tilde{\theta}_n - \hat{\theta}_n\right) \cdot \nabla_\theta{}^2 Q_n\left(\bar{\theta}\right)\left(\tilde{\theta}_n - \hat{\theta}_n\right)$$

$$= \sqrt{n}\left(\tilde{\theta}_n - \hat{\theta}_n\right)' \left\{n^{-1} \nabla_\theta{}^2 Q_n\left(\bar{\theta}_n\right)\right\} \sqrt{n}\left(\tilde{\theta}_n - \hat{\theta}_n\right)$$

We have already been that

$$\sqrt{n}\left(\hat{\theta}_n - \theta_*\right) = -\left\{n^{-1} \nabla_\theta{}^2 Q_n\left(\ddot{\theta}\right)\right\}^{-1} n^{-1/2} \nabla_\theta Q_n(\theta_*)$$

$$= -\left\{n^{-1} \nabla_\theta{}^2 Q_n(\theta_*)\right\}^{-1} n^{-1/2} \nabla_\theta Q_n(\theta_*) + o_\rho(1).$$

And

$$\begin{bmatrix} \tilde{\theta}_n - \theta_* \\ \tilde{\lambda}_n \end{bmatrix} = \begin{bmatrix} \nabla_\theta{}^2 Q_n\left(\bar{\theta}_n\right) & -IR' \\ -IR & 0 \end{bmatrix}^{-1} \begin{bmatrix} -\nabla_\theta Q_n(\theta_*) \\ IR\theta_* - \pi \end{bmatrix}$$

$$\therefore \tilde{\theta}_n - \theta_* = -\left(\nabla_\theta{}^2 Q_n\left(\bar{\theta}_n\right)\right)^{-1}\left(I + (-IR')E^{-1}(-IR) \cdot \left(\nabla_\theta{}^2 Q_n\left(\bar{\theta}_n\right)\right)^{-1}\right)\nabla_\theta Q_n(\theta_*)$$
$$+ \left(\nabla_\theta{}^2 Q_n\left(\bar{\theta}_n\right)\right)^{-1}(-R')E^{-1} \cdot (IR\theta_* - \pi)$$

$$\therefore \sqrt{n}\left(\tilde{\theta}_n - \theta_*\right) = -\left(n^{-1} \nabla_\theta{}^2 Q_n(\theta_*)\right)^{-1}\left(I + (-R') \cdot \left(n^{+1}E\right)^{-1}(-R)\left(n^{-1} \nabla_\theta{}^2 Q_n\left(\bar{\theta}_n\right)\right)^{-1}\right)n^{-1/2} \nabla_\theta Q_n(\theta_*)$$ th
$$+ \left(n^{-1} \nabla_\theta{}^2 Q_n(\theta_*)\right)^{-1}(-R')(nR')(nE)^{-1}\sqrt{n}(IR\theta_* - \pi) + o_\rho(1)$$

us

$$\sqrt{n}\left(\tilde{\theta}_n-\theta_*\right)=-\left(n^{-1}\nabla_\theta{}^2Q_n(\theta_*)\right)^{-1}n^{-1/2}\nabla_\theta Q_n(\theta_*)$$

$$-\left(n^{-1}\nabla_\theta{}^2Q_n(\theta_*)\right)^{-1}(-R')(nE)^{-1}(-IR)\left(n^{-1}\nabla_\theta{}^2Q_n(\theta_*)\right)^{-1}n^{-1/2}\nabla_\theta Q_n(\theta_*)$$

$$+\left(n^{-1}\nabla_\theta{}^2Q_n(\theta_*)\right)^{-1}(-IR')(nE)^{-1}\sqrt{n}(IR\theta_*-\pi)+o_\rho(1)$$

$$=\sqrt{n}\left(\hat{\theta}_n-\theta_*\right)$$

$$-\left(n^{-1}\nabla_\theta{}^2Q_n(\theta_*)\right)^{-1}(-R')(nE)^{-1}(-IR)\left(n^{-1}\nabla_\theta{}^2Q_n(\theta_*)\right)^{-1}n^{-1/2}\nabla_\theta Q_n(\theta_*)$$

$$+\left(n^{-1}\nabla_\theta{}^2Q_n(\theta_*)\right)^{-1}(-IR')(nE)^{-1}\sqrt{n}(IR\theta_*-\pi)+o_\rho(1)$$

Implying that

Digitalization

off diagonal element

diagonal element

Diagonal matrix

j square matrix having all off diagonal elements equal to zero.

$$\begin{pmatrix} d_1 & & & \bigcirc \\ & d_2 & & \\ & & d_3 & \\ \bigcirc & & & d_4 \end{pmatrix}$$

Theover 8.3

$$D=\begin{pmatrix} d_1 & & \bigcirc \\ & d_2 & \\ & & .. \\ \bigcirc & & d_n \end{pmatrix} \qquad \omega=\begin{pmatrix} \omega_1 & & & & \bigcirc \\ & \omega_2 & & & \\ & & \omega_3 & & \\ & & & \omega_4 & \\ \bigcirc & & & & \omega_n \end{pmatrix}$$

1. $D\boldsymbol{\omega}=\boldsymbol{\omega}\mathbf{D}=\begin{pmatrix} d_1\omega_1 & & & \bigcirc \\ & d_2\omega_2 & & \\ & & . & \\ & & & . \\ \bigcirc & & & d_n\omega_n \end{pmatrix}$

2. $|D| = d_1 d_2 \ldots d_n$

3. D is non-singular if any diagonal element is zero.

(ie $|D|=0$)

4. if D is non-singular,

$$D^{-1}=\begin{pmatrix} 1/d_1 & & \bigcirc \\ & 1/d_2 & \\ & & .. \\ \bigcirc & & 1/d_n \end{pmatrix}$$

5. $\underline{\lambda i = \partial_i}$, (i.e, Eigen values of D are it's main diagonal elements)

Example) 8.6

$x_1(0)=2$

$x_2(0)=1$

$$x' = Ax + \begin{pmatrix} e^t \\ \sin t \end{pmatrix} \qquad A = \begin{pmatrix} -1 & 4 \\ 0 & 3 \end{pmatrix}$$

homogeneous soln $\qquad p = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$

$$X_h = P\,\Omega_D(t)\,C = \Omega(t)\,C \qquad D = \begin{pmatrix} -1 & \\ & 3 \end{pmatrix}$$

$$= \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} e^{-t} & 0 \\ 0 & e^{3t} \end{pmatrix} \begin{pmatrix} c_1 \\ c_2 \end{pmatrix}$$

$$= \begin{pmatrix} e^{-t} & e^{3t} \\ 0 & e^{3t} \end{pmatrix} \begin{pmatrix} c_1 \\ c_2 \end{pmatrix}$$

$$\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} c_1 e^{-t} + c_2 e^{3t} \\ 0 + c_2 e^{3t} \end{pmatrix} \Rightarrow \begin{pmatrix} c_1 + c_2 = 2 \\ c_2 = 1 \end{pmatrix}$$

$$\therefore X_h = \begin{pmatrix} e^{-t} & e^{3t} \\ 0 & e^{3t} \end{pmatrix} \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$

|| ||

Ω C

$$X_p = \Omega(t)\,U(t) \qquad = \int \frac{1}{e^{2t}} \begin{pmatrix} e^{3t} & -e^{t3t} \\ & e^{-t} \end{pmatrix} \begin{pmatrix} et \\ \sin t \end{pmatrix} dt$$

$$U = \int \Omega^{-1} G(t) = \int \begin{pmatrix} e^{-t} & e^{3t} \\ 0 & e^{3t} \end{pmatrix} \begin{pmatrix} e^t \\ \sin t \end{pmatrix} dt$$

$$= \int \begin{pmatrix} e^{2t} & -\sin t e^t \\ & \sin t e^{-3t} \end{pmatrix} dt = \int \begin{pmatrix} e^t & -e^t \\ 0 & e^{-3t} \end{pmatrix} \begin{pmatrix} e^t \\ \sin t \end{pmatrix} dt$$

$$\int e^t \sin t\,dt = \frac{e^t(st - dt)}{2}$$

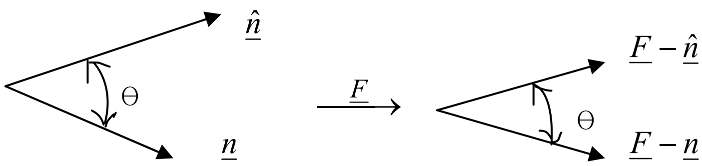
$$\int \sin t e^{-3t} dt = ?$$

$(\sin t e^{-3t})' = -3\sin t e^{3t} + \cos t e^{-3t} \quad \times 3$

$(\cos t e^{-3t})' = -\sin t e^{3t} - 3\cos t e^{-3t} \quad \times (H)$

$3(\sin e^{-3t})' + (\cos t e^{-3t})' = -10 \sin t e^{-3t}$

$$\therefore \int \sin t e^{-3t} dt = \frac{-3\sin t e^{-3t} - \cos t e^{-3t}}{10}$$



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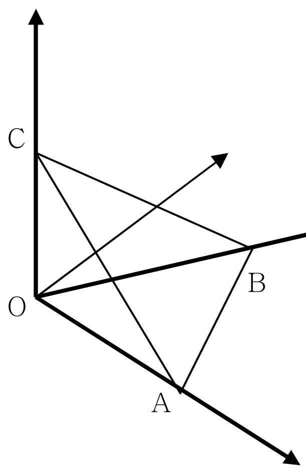

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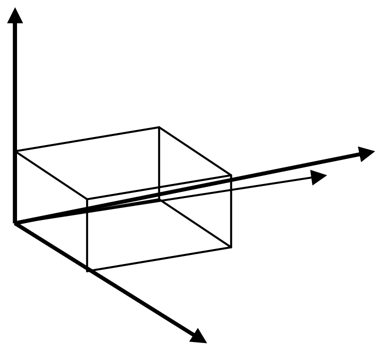
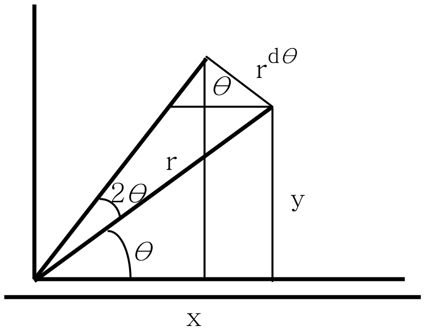
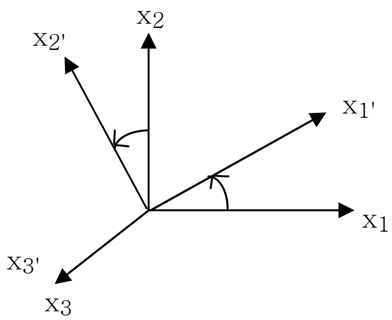




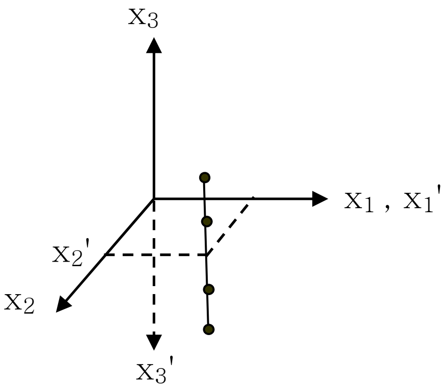


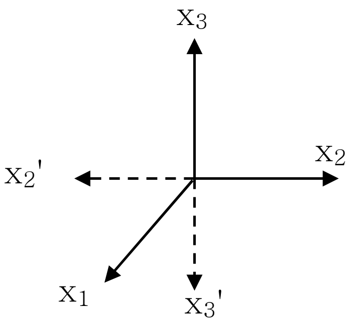
$$\begin{bmatrix} \varepsilon_{11}' & \varepsilon_{12}' & \varepsilon_{13}' \\ \varepsilon_{21}' & \varepsilon_{22}' & \varepsilon_{23}' \\ \varepsilon_{31}' & \varepsilon_{32}' & \varepsilon_{33}' \end{bmatrix} = \begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{11} & \varepsilon_{12} & \varepsilon_{13} \\ \varepsilon_{21} & \varepsilon_{22} & \varepsilon_{23} \\ \varepsilon_{31} & \varepsilon_{32} & \varepsilon_{33} \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

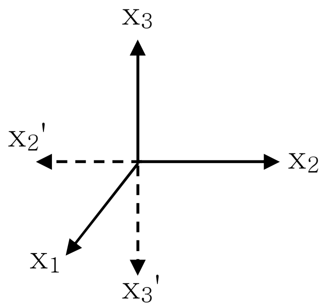
$$= \begin{bmatrix} \cos\theta\varepsilon_{11} + \sin\theta\varepsilon_{21} & \cos\theta\varepsilon_{12} + \sin\theta\varepsilon_{22} & \cos\theta\varepsilon_{13} + \sin\theta\varepsilon_{23} \\ -\sin\theta\varepsilon_{11} + \cos\theta\varepsilon_{21} & -\sin\theta\varepsilon_{12} + \cos\theta\varepsilon_{22} & -\sin\theta\varepsilon_{13} + \cos\theta\varepsilon_{23} \\ \varepsilon_{31} & \varepsilon_{32} & \varepsilon_{33} \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

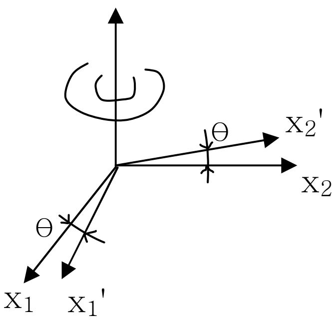
$$= \begin{bmatrix} \cos^2\theta\varepsilon_{11} + \sin 2\theta\varepsilon_{12} + \varepsilon_{22}\sin_2\theta & -\cos\theta\varepsilon_{11} + \sin^2\theta\varepsilon_{21} + \cos^2\theta\varepsilon_{12} + \sin\theta\cos\theta\varepsilon_{22} & \cos\theta\varepsilon_{13} + \sin \\ & \sin^2\theta\varepsilon_{11} + 2\sin\theta\cos\theta\varepsilon_{12} + \cos^2\theta\varepsilon_{22} & -\sin\theta\varepsilon_{13} + co \\ sym & & \varepsilon_{33} \end{matrix}$$

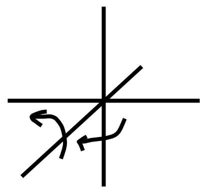
$$
= \begin{bmatrix} \cos^2\theta\varepsilon_{11} + \sin 2\theta\varepsilon_{12} + \sin^2\theta\varepsilon_{22} & -\frac{1}{2}\sin 2\theta \sin\theta(\varepsilon_{22} - \varepsilon_{11}) + \cos 2\theta\varepsilon_{12} & \cos\theta\varepsilon_{13} + \sin\theta\varepsilon_{23} \\ & \sin^2\theta\varepsilon 1_{11} - \sin 2\theta\varepsilon_{12} + \cos^2\theta\varepsilon_{22} & \cos\theta\varepsilon_{23} - \sin\theta\varepsilon_{31} \\ sym & & \varepsilon_{33} \end{bmatrix}
$$

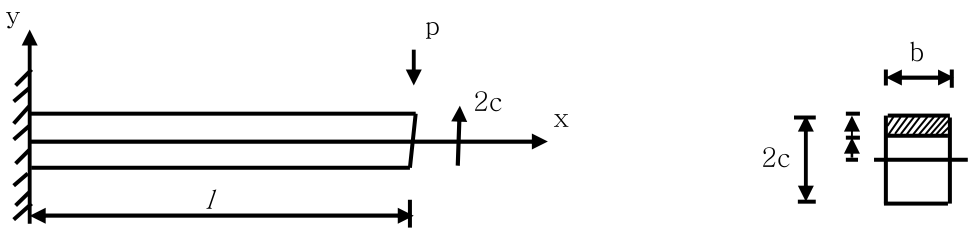








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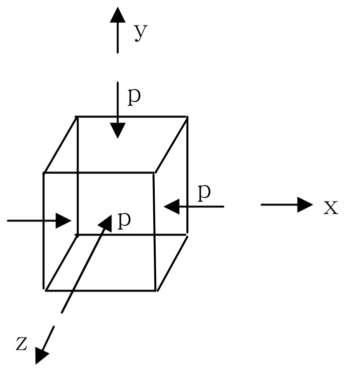
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