

Paper-1 ✓ General

$$\boxed{A \bar{B} = 0}$$

$$|A||\bar{B}| = |A\bar{B}| = 0$$

$$|A| \neq 0 \quad A^{-1} A \bar{B} = A^{-1} 0 \quad \text{adj}(A) = |A|^{n-2} A = |A| A \quad A^T (\text{adj } A^T) = |A^T| I$$

$$(A^{-1})^T = (A^T)^{-1} \quad (A^T)^T = A^T$$

$$\left( \frac{\text{adj } A}{|A|} \right)^T = \frac{\text{adj } A^T}{|A^T|} \quad D^2 = \begin{cases} d_1 & 0 & \dots & 0 \\ 0 & d_2 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & d_n \end{cases} \quad \begin{cases} d_1 & 0 & \dots & 0 \\ 0 & d_2 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & d_n \end{cases} = \begin{cases} d_1^2 & 0 & \dots & 0 \\ 0 & d_2^2 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & d_n^2 \end{cases}$$

$$\Rightarrow \cancel{\frac{1}{|A|} (\text{adj } A)^T} = \cancel{\frac{\text{adj } (A^T)}{|A^T|}}$$

$$|A| (A^{-1}) = |A| A^{-1} = I \quad AA^{-1} = I$$

$$\begin{bmatrix} ap + bq \\ cp + dq \end{bmatrix} = \begin{bmatrix} p \\ q \end{bmatrix}$$

$$ap + bq = p \Rightarrow (a-1)p + bq = 0$$

$$cp + dq = q \Rightarrow cp + (d-1)q = 0$$

$$\begin{bmatrix} a+2c & b+2d \\ 3a+4c & 3b+4d \end{bmatrix} = \begin{bmatrix} a+3b & 2a+4b \\ c+3d & 2c+4d \end{bmatrix} \begin{vmatrix} a-1 & b \\ c & d-1 \end{vmatrix} = 0$$

$3b = 2c \checkmark$

$$\begin{bmatrix} -1 & 1 \\ 1 & -1 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} \begin{bmatrix} -1 & 1 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} \begin{bmatrix} -1 & 1 \\ -1 & 1 \end{bmatrix} \checkmark$$

$\begin{bmatrix} a & b \\ c & d \end{bmatrix}^2 = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

$a_1 a_{21} = 1$   
 $a_1 a_{22} = -1$

$$x_1 + x_2 + y_1 + y_2 + z_1 + z_2 = 0$$

$$\begin{aligned}
 3y - 3\lambda - 2z &= 2 \\
 \lambda + 1z &= 0 \\
 y - \lambda z &= 6
 \end{aligned}
 \Rightarrow \frac{3y + 3\lambda - 2z = 2}{(\lambda + 1)(3y - 2) = 0}$$

$$\begin{aligned}
 A^2 &= I \\
 A^3 &= A \\
 A^4 = A^2 &= I
 \end{aligned}
 \quad
 \begin{aligned}
 &\left( \cos^2 \theta + \cos^4 \theta + \cos^6 \theta + \dots \right) \\
 &+ \left( \sin^2 \theta + \sin^4 \theta + \dots \right) \\
 &= \cos^2 \theta + \sin^2 \theta
 \end{aligned}$$

Matrices

$\left\{ \begin{matrix} x - II \\ III \end{matrix} \right.$

$l =$

A diagram of a triangular matrix. The top-left element is labeled  $a_{11}$ . The second row has two elements:  $a_{21}$  and  $a_{22}$ . The third row has three elements:  $a_{31}$ ,  $a_{32}$ , and  $a_{33}$ . The fourth row has four elements:  $a_{41}$ ,  $a_{42}$ ,  $a_{43}$ , and  $a_{44}$ . The fifth row has five elements:  $a_{51}$ ,  $a_{52}$ ,  $a_{53}$ ,  $a_{54}$ , and  $a_{55}$ . Ellipses indicate that the pattern continues for more rows and columns.

$$l = 1 + \left( n + (n-1) + (n-2) + \dots + 1 \right)$$

$$n = n + 1$$

$$P = 1 + 2 + 3 + \dots + (n-1)$$

$$D = \begin{bmatrix} 5 & -3 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 5 & 3 \end{bmatrix} \begin{bmatrix} 5 & -3 \\ 2 & 1 \end{bmatrix}$$

$$\int \frac{x^4+1}{1+x^2} dx = \int \left(x^2-1 + \frac{1}{1+x^2}\right) dx = \frac{x^3}{3} - x + \tan^{-1} x + C.$$

$$\int \frac{dx}{\sqrt{9-4x^2}} = \frac{1}{2} \int \frac{dx}{\sqrt{\frac{9}{4}-x^2}} = \frac{1}{2} \sin^{-1}\left(\frac{x}{\sqrt{\frac{9}{4}}}\right) + C$$

$$\begin{aligned} \int \frac{dx}{(x^2-4x+5)(x^2-4x+4)} &= \int \left( \frac{1}{(x-2)^2} - \frac{1}{(x-2)^2+1} \right) dx \\ &= -\frac{1}{x-2} - \tan^{-1}(x-2) + C. \end{aligned}$$

$$\begin{aligned}
 & \int \frac{dx}{(2x-7)\sqrt{(x-3)(x-4)}} = \frac{1}{2} \int \frac{dx}{\left(x-\frac{7}{2}\right)\sqrt{\left(x-\frac{7}{2}\right)^2 - \frac{1}{4}}} \\
 & \quad \text{Let } u^2 = x^2 - 7x + 12 \\
 & = \frac{1}{2} \times \frac{1}{1/2} \sec^{-1} \left( \frac{x-\frac{7}{2}}{1/2} \right) + C \\
 & = \sec^{-1} (2x-7) + C
 \end{aligned}$$