Algebra.

STUDENT NAME: KABARIKAA		TOTAL MARKS OBTAINED
CLASS: 12B	SUBJECT: Maths	
ROLL NO.: 2	DATE: 12.11.25	

SECTION A

1) $a_{ij} = \frac{(i + 2j)^2}{2}$

$= \frac{(2 + 2(2))^2}{2}$

$= \frac{(2+4)^2}{2}$

$= \frac{6^2}{2}$

$= \frac{36}{2}$

$= 18$

$A = \begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix}$

2) $2\begin{pmatrix} x & 5 \\ 7 & y-3 \end{pmatrix} + \begin{pmatrix} 3 & -4 \\ 1 & 2 \end{pmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$

$\begin{pmatrix} 2x & 10 \\ 14 & 2y-6 \end{pmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{pmatrix} 7 & 6 \\ 15 & 14 \end{pmatrix}$

~~$2x+3 \quad 10+1$~~

$\begin{bmatrix} 2x+3 & 10-4 \\ 14+1 & 2y-6+2 \end{bmatrix} = \begin{pmatrix} 7 & 6 \\ 15 & 14 \end{pmatrix}$

$2x + 3 = 7 \qquad 2y - 6 + 2 = 14$

$2x = 7 - 3 \qquad 2y = 14 + 6 - 2$

$2x = 4 \qquad 2y = 18$

$\boxed{x = 2 \qquad y = 9}$

3) $A = \begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 0 & 4 \\ -1 & 7 \end{bmatrix}$

$3A^2 - 2B + I$ ——(1)

$3A^2 = 3\begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}\begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}$

$= \begin{bmatrix} 6 & -3 \\ 9 & 6 \end{bmatrix}\begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}$

$= \begin{bmatrix} (12-9) & (-6+(-6)) \\ (18+18) & (-9+12) \end{bmatrix}$

$= \begin{bmatrix} 3 & -12 \\ 36 & 3 \end{bmatrix}$

$2B = 2\begin{bmatrix} 0 & 4 \\ -1 & 7 \end{bmatrix}$

$= \begin{bmatrix} 0 & 8 \\ -2 & 14 \end{bmatrix}$

3 using equation —(1)

$3A^2 - 2B + I$

$\begin{bmatrix} 3 & -12 \\ 36 & 3 \end{bmatrix} - \begin{bmatrix} 0 & 8 \\ -2 & 14 \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$\begin{bmatrix} (3-0) & (-12-8) \\ (36+2) & (3-14) \end{bmatrix} + \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

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$$\begin{bmatrix} 3 & -20 \\ 38 & -11 \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 3 & -20 \\ 38 & -11 \end{bmatrix}$$

5) A's order = 3, $|A| = -5$ $[adj(A)] = ?$

$$|Adj\ A| = |A|^{n-1}$$
$$= (-5)^{3-1}$$
$$= (-5)^2$$
$$= 25$$

6) taking $x = 2$

$$\begin{pmatrix} 4 & 4 \\ 3 & -2 \end{pmatrix}$$

∴ a singular matrix.

7) Symmetric matrix is a matrix that is symmetric in nature. ~~For example~~ when $A' = A$

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

∴ It is symmetric since $A' = A$

8) $\Delta = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$

$8 - 14 = -6$

9) $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, $A + A' = ?$

$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} + \begin{pmatrix} 1 & 3 \\ 2 & 4 \end{pmatrix}$

$\begin{bmatrix} (1+1) & (2+3) \\ (3+2) & (4+4) \end{bmatrix} = \begin{bmatrix} 2 & 5 \\ 5 & 8 \end{bmatrix}$

SECTION B

10) $A = \begin{pmatrix} 3 & \sqrt{3} & 2 \\ 4 & 2 & 0 \end{pmatrix}$ $B = \begin{bmatrix} 2 & -1 & 2 \\ 1 & 2 & 4 \end{bmatrix}$

$(A+B)' = A' + B'$ Prove.

$(A+B)' = \begin{pmatrix} 3 & \sqrt{3} & 2 \\ 4 & 2 & 0 \end{pmatrix} + \begin{pmatrix} 2 & -1 & 2 \\ 1 & 2 & 4 \end{pmatrix}$

$LHS = \begin{bmatrix} 3 & 4 \\ \sqrt{3} & 2 \\ 2 & 0 \end{bmatrix} + \begin{pmatrix} 2 & 1 \\ -1 & 2 \\ 2 & 4 \end{pmatrix}$

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$A^1 + B^1$

$$RHS' = \begin{bmatrix} 3 & 4 \\ \sqrt{3} & 2 \\ 2 & 0 \end{bmatrix} + \begin{bmatrix} 2 & 1 \\ -1 & 2 \\ 2 & 4 \end{bmatrix}$$

LHS = RHS

Hence proved.

11) $A = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$ show $A^2 - 5A + 7I = 0$

$$I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad 0 = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

using equation

$$\begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}\begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix} - 5\begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix} + 7\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} =$$

$$\begin{bmatrix} (9-1) & (3+2) \\ (-3-2) & 2(-1+4) \end{bmatrix} - \begin{bmatrix} 15 & 5 \\ -5 & 10 \end{bmatrix} + \begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix}$$

$$\begin{pmatrix} 8 & 5 \\ -6 & 3 \end{pmatrix} - \begin{bmatrix} 15 & 5 \\ -5 & 10 \end{bmatrix} + \begin{pmatrix} 7 & 0 \\ 0 & 7 \end{pmatrix}$$

$$\begin{pmatrix} -7 & 0 \\ -0 & -7 \end{pmatrix} + \begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$$

Hence proved.

12) prove $\begin{vmatrix} x+y & z & 1 \\ x+z & x & 1 \\ z+x & y & 1 \end{vmatrix} = 0$

$(x+y)(x+y) - (x+z)(z+y) + (z+x)(z+y) = 0$

13) $A = \begin{bmatrix} 0 & -5 \\ 5 & 0 \end{bmatrix}$ $A' \begin{bmatrix} 0 & 5 \\ -5 & 0 \end{bmatrix}$

$B = \begin{pmatrix} 2 & -4 \\ 4 & 2 \end{pmatrix}$ $B' \begin{bmatrix} 2 & 4 \\ -4 & 2 \end{bmatrix}$

$AB - BA$

$\begin{bmatrix} 0 & -5 \\ 5 & 0 \end{bmatrix}\begin{bmatrix} 2 & -4 \\ 4 & 2 \end{bmatrix} - \begin{pmatrix} 2 & -4 \\ 4 & 2 \end{pmatrix}\begin{bmatrix} 0 & -5 \\ 5 & 0 \end{bmatrix}$

$\begin{bmatrix} (0-20) & (0+20) \\ (20+0) & (0+0) \end{bmatrix} - \begin{pmatrix} (0-20) & (-10-0) \\ (0+10) & (-20+0) \end{pmatrix}$

$\begin{bmatrix} -20 & 20 \\ 20 & 0 \end{bmatrix} - \begin{bmatrix} -20 & -10 \\ 10 & -20 \end{bmatrix}$

$\therefore$ Skew-symmetric matrix.

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SECTION C

14) $x + y + z = 6$

$x + y + 3 + 3(2) = 11$

$x + 3z = 2y$

$$\begin{bmatrix} x & y & z \\ x & y+3 & 3z \\ x & 0 & 3z \end{bmatrix} = \begin{bmatrix} 6 \\ 11 \\ 2y \end{bmatrix}$$

15) $2x - y + 3z = 9$

$x + y + z = 6$

$x - y + z = 2$

$$D = \begin{bmatrix} 2x & -y & +3z \\ x & +y & +z \\ x & -y & +z \end{bmatrix} \quad \begin{bmatrix} 9 \\ 6 \\ 2 \end{bmatrix}$$

$x = \frac{D_1}{D} \qquad y = \frac{D_2}{D} \qquad z = \frac{D_3}{D}$

16) Honesty + Regularity + Hardwork = 6000

~~3 Hard~~

Let Honesty be x, regularity be y & Hardwork be z

$x + y + z = 6000$

$x + 3 + y + 3z = 11,000$

$2x + y + 2z$