Don Bosco Catholic Secondary & Preparatory School A.A 2012 E.C

4th Quarter Mathematics worksheet 27 for Grade 11

Name _____section ___ Roll No. __

Choose the best answer from the given alternatives

1. Which of the following is equal to $\begin{vmatrix} 1 & a & b+c \\ 1 & b & a+c \\ 1 & c & a+b \end{vmatrix}$?

   A) 2a B) 2c C) 0 D) a

2. Which of the following is ***not always true*** about the matrixe A and B, r any scalar, AB is defined?

   A) $(AB)^T = B^TA^T$ C) $(A^T)^T = A$

   B) $(rA)^T = rA^T$ D) $(AB)^T = (BA)^T$

3. What is the modulus of Z = $\frac{(1+i)^4}{(1+2i)(2-i)}$?

   A) 4 B) 4/5 C) $\frac{2}{\sqrt{5}}$ D) $\frac{16}{25}$

4. Which of the following is the simplified form of $i^{320} - 5i^{121}+3i^{45}$?

   A) –i B) i C) 9i D)7i

5. Let A be a 3x3 matrix if det (A)= 8, then det (3A) is equal to:-

   A) 24 B) 11 C) 216 D) 36

6. If $\begin{vmatrix} x & 2 \\ 1.5+x & x \end{vmatrix} = 0$, then the value of x is:-

   A) -3,1 B) 3,-1 C) 3,1 D) -1,-3

7. *Which one of the following is false*

   A. Every invertible matrix is a square matrix

   B. If B is the inverse of A, then A is the inverse of B.

   C. Inverse of a matrix is not unique

   D. If A is invertible so its transpose.

Take correction of worksheet 27 (Matrices and determinants) at the end of these Questions

8. Let matrix A = $\begin{pmatrix} 1 & 2 & -3 \\ 5 & 0 & 2 \\ 3 & -1 & 1 \end{pmatrix}$, matrix B = $\begin{pmatrix} 3 & -1 & 2 \\ 4 & 2 & 5 \\ 2 & 0 & 3 \end{pmatrix}$ and A+2C = $3B^T$, then what matrix C?

A) $\begin{pmatrix} 4 & 7/2 & 3/2 \\ -5 & 6 & 1 \\ 9/2 & 13/2 & 4 \end{pmatrix}$

B) $\begin{pmatrix} 4 & 5 & 2 \\ -4 & 3 & -1 \\ 2 & 8 & 4 \end{pmatrix}$

C) $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

D) $\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

9. For what values of x the equation

$$\begin{vmatrix} 2 & -2 & 1 \\ x & 1 & 0 \\ 3 & 1 & 2 \end{vmatrix} = 1 \text{ is true}$$

A. X =0 B. x = 1 C. x = 2 D. x =3

10. *If A* = $\begin{pmatrix} 2 & -3 \\ 1 & 2 \end{pmatrix}$ *and B*= $\begin{pmatrix} 1 & -1 \\ 0 & -2 \end{pmatrix}$ *then which of the following is equal to* $A^T + 2B$

A. $\begin{pmatrix} 4 & -5 \\ 1 & -2 \end{pmatrix}$ *B.* $\begin{pmatrix} 3 & -4 \\ 1 & 0 \end{pmatrix}$

C. $\begin{pmatrix} 4 & -1 \\ -3 & -2 \end{pmatrix}$ *D.* $\begin{pmatrix} 5 & -3 \\ 1 & -2 \end{pmatrix}$

11. Let A and B be 3 x 3 matrices such that B= $\begin{pmatrix} 1 & 4 & 0 \\ 2 & 0 & 0 \\ 0 & -1 & 1 \end{pmatrix}$ and $|A|$ = 1/16, then $|2B\,A^T|$ is equal to

A. 4 B. -4 C. 1 D. -1

12. Let A be a unit matrix, then the det (A) is :-

A) 0 B) 1 C) 2 D) -1

13. If A =$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, B = $\begin{pmatrix} 4 & 5 \\ 6 & 7 \end{pmatrix}$, then find a matrix C such that A+B+C = 0?

A) $\begin{pmatrix} -5 & -7 \\ -9 & -11 \end{pmatrix}$

B) $\begin{pmatrix} 5 & 7 \\ 9 & 11 \end{pmatrix}$

C)$\begin{pmatrix} -3 & -3 \\ -3 & 2 \end{pmatrix}$

D) None

14. Let A =$\begin{pmatrix} 5 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 9 \end{pmatrix}$, then the determinants of A is:-

A) 27 B) 15 C) 135 D) 0

15. For any n x n square matrix A, which one of the following is true?

A) det (A) = - det(A^T) where A^T is the transpose of A.

B) If K is a scalar, then det(KA) = K^n det (A)

C) If B a matrix obtained from A by interchanging of two rows of A, then det(B) = det (A)

D)If A is invertible, then det(A) = det (A^{-1})

16. Under the set of complex numbers the solution set of $x^2 - 4x + 13 = 0$ is equal to

A. $\{2 \pm 3i\}$ B. $\{\pm 3i\}$ C. $\{\pm 2\}$ D. $\{-2 \pm 3i\}$

17. The simplified form of the complex number $\frac{(2+i)(3-i)}{i-1}$

A. 3 + 4i B. -3 + 4i C. -3 – 4i D. -4 – 3i

18. If z = x + iy, then when the equation z = (2 – 3i) (1 – i) + 3 is solved. What are the values of x and y respectively.

A. 3, 4 B. 3, -5 C. -5, 2 D. 0 , 1

19. The modulus of $\frac{3-2i}{i^{10}} + \frac{3-2i}{i-2}$ is equal to

A. $\frac{\sqrt{34}}{5}$ B. $\frac{\sqrt{78}}{5}$ C. $\sqrt{26}$ D. $\sqrt{130}$

20. For z = x + iy which of the following represents the circle $(x-2)^2 + (y+1)^2 = 9$

A. /z – 2+i/ = 3 C. /z + 1 – 2i/ = 3

B. /z – 2 + i/ = 9 D. /z + 1 – 2i/ = 3

21. If the complex number x + iy correspond to the point (x , y) to what point does $3i - \sqrt{-9}$ correspond

A. (3, 3) B. (0 , 0) C. (0 , 6) D. (3, -3)

22. In the set of complex numbers the solution set of x^2 - 2x + 9 = 0 is

A. R B. $[-2\sqrt{2}i, 2\sqrt{2}i$ C. {2i, -3i} D. $\{1-2\sqrt{2}i,\ 1+2\sqrt{2}i\}$

23. For Z = x + iy which of the following represent the circle $(x+2)^2 + (y-3)^2$ = 16

A. $|Z|$ = 4 C. $|Z+2| = 4$

B. $|Z+2-3i| = 4$ D. $|Z+3i\,| = 4$

24. A polar form of the complex number Z = $\frac{1+\sqrt{3i}}{1+i}$ is

A. $\sqrt{2}$ (cos 60° + isin60°) C. $\frac{1}{\sqrt{2}}$ (cos 105° + isin 105°)

$B.\ 2(\cos 30° + \text{isin } 30°)$ D. $\sqrt{2}$(cos 15° + isin 15°)

25. The values of x and y that solves the equation 2x + 3xi + 2y = 28 + 9i are

A. X = 3, y = 11 C. x = 11 , y = 3

B. X = 0, y = 3 D. x = 1, y = 1

I. Solve each of the following (Show all the necessary steps clearly and neatly)

26. Solve each of the following using cramer's rule

a) $\begin{cases} 2x + 3y = 11 \\ x - 3z = 5 \\ x + y - 2z = 0 \end{cases}$

b) $\begin{cases} 2x + y = 1 \\ 6x - 3 = y \end{cases}$

27. Find the inverse of the matrix $\begin{pmatrix} 2 & 4 & 2 \\ 3 & 1 & 1 \\ 1 & 0 & 1 \end{pmatrix}$

28. If A = $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$, show that det (rA) = r^2 det (A)

29. Use cramer's Rule to solve the given equation below $\begin{cases} -x + 4y - z = 1 \\ 2x - y + z = 0 \\ x + y + z = 1 \end{cases}$

30. Determine the values of a and b for which the system $\begin{cases} 3x - 2y + z = b \\ 5x - 8y + 9z = 3 \\ 2x + y + az = -1 \end{cases}$

a) has only one solution
b) has infinite many solution
c) has no solution

Grade 11 Math Worksheet 27 Date 13/8/12 E.C

Solution to Matrices Questions (part I)

1. False, A lower triangular matrix is a square matrix whose element below the main diagonal are non-zero.

eg $A=\begin{pmatrix}4&0&0\\-2&6&0\\4&9&7\end{pmatrix}$, $B=\begin{pmatrix}2&0\\3&0\end{pmatrix}$ $C=\begin{pmatrix}1&0&0\\0&0&0\\0&0&0\end{pmatrix}$ A, B, C are a lower triangular matrices

where as

$D=\begin{pmatrix}1&2&3\\0&5&1\\0&0&6\end{pmatrix}$, $E=\begin{pmatrix}-4&9\\0&2\end{pmatrix}$, $F=\begin{pmatrix}4&0&0\\0&0&0\\0&0&0\end{pmatrix}$ D, E, F are an upper triangular matrices

2. True, Let $A=\begin{pmatrix}3&4&5\\-1&1&0\\2&5&1\end{pmatrix}$ $A^T=\begin{pmatrix}3&-1&2\\4&1&5\\5&0&1\end{pmatrix}$, then

$$A+A^T=\begin{pmatrix}3+3&4+(-1)&5+2\\-1+4&1+1&0+5\\2+5&5+0&1+1\end{pmatrix}=\begin{pmatrix}6&3&7\\3&2&5\\7&5&2\end{pmatrix}$$ symmetric matrix.

short cut A matrix A is said to be symmetric draw the diagonal, then fold on the diagonal line the nos are equal.

3. Let $A=(a_{ij})_{mxn}$ and $B=(b_{ij})_{kxp}$,

AB exist when Column A = n and row B = k are equal.

∴ $n=k$, so AB have order mxp. Ans C

4. $\begin{pmatrix}2&-2\\y&z-1\end{pmatrix}\begin{pmatrix}8&z\\5&4\end{pmatrix}=\begin{pmatrix}x&4\\1&2\end{pmatrix}$

$\begin{pmatrix}16-10&2z-8\\8y+5z-5&yz+4z-4\end{pmatrix}=\begin{pmatrix}x&4\\1&2\end{pmatrix}$, $x=16-10=6$, $x=6$

$2z-8=4$, $2z=12$, $z=6$

$8y+5z-5=1$

$8y+5(6)-5=1$

$8y=1-25=-24$

$y=-3$

∴ $x=6$ and $y=-3$ Ans C

5. Ans C, see solution on Note.

6. $A=\begin{pmatrix}-1&3&1\\2&4&x\end{pmatrix}$ and $B=\begin{pmatrix}1&2\\0&7\\9&1\end{pmatrix}$ BA, a_{23} (row, column)

$BA=\begin{pmatrix}1&2\\0&7\\9&1\end{pmatrix}\begin{pmatrix}-1&3&1\\2&4&x\end{pmatrix}$

no need to multiply all entries of BA. simply Find a_{23} of BA. (row 2, column 3)

$BA_{23}=14 \Rightarrow 0\cdot 1+7\cdot x=14$

$0+7x=14$

$7x=14 \Rightarrow x=2$ Ans A

7. $DA = B$, to Find D multiply both sides by A^{-1} (inverse of A)

Note $A \cdot I = A$, where A is any matrix and I is identity

eg $A = \begin{pmatrix} 2 & 3 \\ 3 & 4 \end{pmatrix}$ $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, then $AI = A$.

$DA = B$

$\Rightarrow DA \cdot A^{-1} = B \cdot A^{-1}$

$D\underbrace{A \cdot A^{-1}}_{I} = B \cdot A^{-1}$

$DI = B \cdot A^{-1}$

$D = B \cdot A^{-1}$

Given $A = \begin{pmatrix} 2 & 3 \\ 3 & 4 \end{pmatrix}$, then

For $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$, $A^{-1} = \frac{1}{|A|}\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$

$|A| = \begin{vmatrix} 2 & 3 \\ 3 & 4 \end{vmatrix} = 2 \cdot 4 - 3 \cdot 3 = 8 - 9 = -1$

$A^{-1} = \frac{1}{-1}\begin{pmatrix} 4 & -3 \\ -3 & 2 \end{pmatrix} = \begin{pmatrix} -4 & 3 \\ 3 & -2 \end{pmatrix}$

Thus, $D = B \cdot A^{-1} = \begin{pmatrix} -1 & 1 \\ 2 & -3 \end{pmatrix} \cdot \begin{pmatrix} -4 & 3 \\ 3 & -2 \end{pmatrix}$

$= \begin{pmatrix} 4+3 & -3-2 \\ -8-9 & 6+6 \end{pmatrix} = \begin{pmatrix} 7 & -5 \\ -17 & 12 \end{pmatrix}$ Ans D

8. Suppose $A = \begin{pmatrix} 2 & 1 & 0 \\ 3 & 7 & -1 \\ -2 & 4 & x \end{pmatrix}$ & $B = \begin{pmatrix} 5 & 6 \\ 7 & 8 \\ 1 & 2 \end{pmatrix}$

AB $a_{31} = 3$ (3rd row, 1st column)

$-10 + 28 + x = 3$

$18 + x = 3$

$x = -15$ Ans C

9. Let $A = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ A^{2k+1}

$A^1 = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

$A^2 = A \cdot A = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \cdot \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

$A^3 = A^2 \cdot A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

$A^4 = A^2 \cdot A^2 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

$A^5 = A^4 \cdot A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

$2k$, $k = 1, 2, 3, \ldots$

$2, 4, 6, \ldots$ $A^{2k} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = I$

$2k+1$, $k = 1, 2, 3, \ldots$

$3, 5, 7, \ldots$

Generally $A^{2k} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ and $A^{2k+1} = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} = A$. Ans D

10. A. $\begin{pmatrix} -3 & 0 \\ 1 & 0 \end{pmatrix}$ is a lower triangular matrix.

B. Let $C = \begin{pmatrix} 4 & 2 \\ 0 & 5 \end{pmatrix}$ is upper triangular matrix, $C^T = \begin{pmatrix} 4 & 0 \\ 2 & 5 \end{pmatrix}$ lower triangular

C. $I = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ identity matrix of order 3x3, written I_3.

it is both upper and lower triangular matrix

D. If A is upper or lower triangular matrix, then

$\det A = |A| = a_{11} a_{22} a_{33} \cdots a_{nn}$ (i.e product of diagonal elements)

Ans D

11. $\begin{pmatrix} 0 & 2 & -4 \\ -2 & 0 & 6 \\ 4 & m & 0 \end{pmatrix}$ A matrix A is said to symmetrix if $A = A^T$. Where as matrix A is said to be skew matrix if $A = -A^T$.

Short cut A matrix A is said to be skew draw diagonal then corresponding elements are opposite sign.

i.e $m = -6$, $4 = -4$, $-2 = 2$. Ans B

12. $A_{3\times4}\ B_{4\times5}\ C_{5\times1} = ABC_{3\times1}$ Ans A

Part II : Solution to Determinants Questions

13. False, If B is a matrix Obtained by adding a multiple of row/column of A to another row/column of A, then $|B| = |A|$.

14. False, $\begin{vmatrix} a & a \\ b & d \end{vmatrix} + \begin{vmatrix} x & v \\ b & d \end{vmatrix} = ad - ba + xd - bv \neq \begin{vmatrix} a+x & c+v \\ b & d \end{vmatrix} = ad + xd - bc - bv$

15. True, # A matrix A is said to be singular (has no inverse) if $\det A = 0$.

A matrix A is said to be non-singular (it have an inverse) if $\det A \neq 0$.

16. True.

17. Ans A, It has no effect by properties of determinant.

18. singular means $\det A = 0$, so

$$\begin{vmatrix} 1 & 2 & -1 \\ -x & 1 & 2 \\ 2 & -1 & x \end{vmatrix} = (x + 8 - x) - (-2 - 2 - 2x^2) = 0$$

duplicate x 8 -2 -2 $-2x^2$

$-x = 8 + 4 + 2x^2 = 0$

$2x^2 = -12$

$x^2 = -6$, $x = \pm\sqrt{-6}$ no solution

Ans C

19. $\begin{vmatrix} x+9 & 3 & 5 \\ x+9 & x+2 & 5 \\ x+9 & 3 & x+4 \end{vmatrix} = 0 \Rightarrow$ $5x^2+55x+90$, $15x+135$, $3x^2+39x+108$, $x^3+15x^2+62x+72$, $15x+135$

$= x^3+15x^2+62x+72+15x+135+15x+135-5x^2-55x-90-15x-135-3x^2-39x-108$

lower value, upper value

$= x^3 + 7x^2 - 17x + 9 = 0$

$\Rightarrow x = -9$ or $x = 1$

Ans A substitute and Check.

20. $\begin{pmatrix} x & 1 \\ 3 & 1 \end{pmatrix} \cdot \begin{pmatrix} -1 & y \\ 3 & -2 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = I_2$

$\Rightarrow \begin{pmatrix} -x+3 & xy-2 \\ -3+3 & 3y-2 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

$\Rightarrow -x+3=1 \quad xy-2=0$

$-x=-2 \quad 2y-2=0$

$x=2 \quad 2y=2$

$y=1$ Ans D

Choice A & D same, make D. 2, 1

21. $\begin{cases} 3x-ay=1 \\ 6x+4y=6 \end{cases}$ no soln

determinat of coefficient matrix

1) unique soln if $\begin{vmatrix} 3 & -a \\ 6 & 4 \end{vmatrix} \neq 0$ $\quad \begin{cases} 3x & -ay \\ 6x & +4y \end{cases} \quad A = \begin{pmatrix} 3 & -a \\ 6 & 4 \end{pmatrix}$

2) no soln if $\begin{vmatrix} 3 & -a \\ 6 & 4 \end{vmatrix} = 0$ and $\begin{vmatrix} 3 & 1 \\ 6 & 6 \end{vmatrix} \neq 0$

so, $\begin{vmatrix} 3 & -a \\ 6 & 4 \end{vmatrix} = 0 \Rightarrow 12+6a=0$ $\quad$ Also, $\begin{vmatrix} 3 & 1 \\ 6 & 6 \end{vmatrix} \neq 0$

$6a=-12$ $\quad 3b-6 \neq 0$

$a=-2$ $\quad 3b \neq 6$

$b \neq 2$

Ans C

22. $A = \begin{pmatrix} a & a & ac \\ b & -b & bc \\ c & c & -c^2 \end{pmatrix}$ $\quad \det A = \begin{pmatrix} a & a & ac & a & a \\ b & -b & bc & b & -b \\ c & c & -c^2 & c & c \end{pmatrix}$

$-abc^2 \quad abc^2 \quad -abc^2 \quad abc^2 \quad abc^2 \quad abc^2$

$= abc^2 + abc^2 + abc^2 - (-abc^2 + abc^2 - abc^2)$

$= 3abc^2 + abc^2 - abc^2 + abc^2$

$= 4abc^2$ Ans D

23. $\det A = 3, \quad B = \begin{pmatrix} 0 & 4 & 8 \\ 5 & 0 & 6 \\ 0 & 4 & 2 \end{pmatrix}$ $\quad \det B = \begin{pmatrix} 0 & 4 & 8 & 0 & 4 \\ 5 & 0 & 6 & 5 & 0 \\ 0 & 4 & 2 & 0 & 4 \end{pmatrix}$

0 0 40

0 0 160

$= 0+0+160-(0+0+40)$

$= 160-40 = 120$

$|B| = |B^T| = 120$

$\det(A^{-1}B^T) = \det A^{-1} \cdot \det(B^T)$

$= \frac{1}{3} \cdot 120 = 40$

$A \cdot A^{-1} = I$

$\det(A \cdot A^{-1}) = \det I$

$\det A \cdot \det A^{-1} = \det I$

Ans A

$3 \cdot \det A^{-1} = 1$

$\det A^{-1} = \frac{1}{3}$

24. $B = \begin{pmatrix} 2 & -1 \\ 3 & 0 \end{pmatrix}$, $AB = A+B$

Let $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$, then $AB = A+B$

$\Rightarrow \begin{pmatrix} a & b \\ c & d \end{pmatrix} \cdot \begin{pmatrix} 2 & -1 \\ 3 & 0 \end{pmatrix} = \begin{pmatrix} a & b \\ c & d \end{pmatrix} + \begin{pmatrix} 2 & -1 \\ 3 & 0 \end{pmatrix}$

$\begin{pmatrix} 2a+3b & -a \\ 2c+3d & -c \end{pmatrix} = \begin{pmatrix} a+2 & b-1 \\ c+3 & d \end{pmatrix}$

$2a+3b = a+2$ & $-a = b-1$

$a+3b = 2$ $\quad a = -b+1$

$-b+1+3b = 2$

$2b = 1$

$b = 1/2$, $a = -1/2+1 = 1/2$

$a = 1/2$

$2c+3d = c+3$

$c+3d = 3$, $-c = d$

$c+3(-c) = 3$

$-2c = 3$

$c = -3/2$, $d = 3/2$

$\therefore A = \begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} 1/2 & 1/2 \\ -3/2 & 3/2 \end{pmatrix}$ Ans C

25. $A \cdot D = I$, because A and D are inverse to each other.

$\det(A \cdot D) = \det I$

$\det A \cdot \det D = 1$

$\det A = \frac{1}{\det D} \Rightarrow \det A^T = \frac{1}{\det D^T} \Rightarrow \det A^T \cdot \det D^T = 1$

$\det(A^T \cdot D^T) = \det(I)$

$A^T \cdot D^T = I$

A^T has inverse D^T.

Ans C

26. $\begin{cases} 3x - ay = 1 \\ bx + 4y = 6 \end{cases}$ no solution means $\begin{vmatrix} 3 & -a \\ b & 4 \end{vmatrix} = 0$ and $\begin{vmatrix} 3 & 1 \\ b & 6 \end{vmatrix} \neq 0$ and $\begin{vmatrix} 1 & -a \\ 6 & 4 \end{vmatrix} \neq 0$

$18 - b \neq 0$ $\quad 4 + 6a \neq 0$

$-b \neq -18$ $\quad 6a \neq -4$

$b \neq 18$ $\quad a \neq -2/3$

Ans D

27. $\begin{pmatrix} 5 & 2 & 1 \\ 3 & 2 & 0 \\ 1 & 0 & 2 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 8 \\ 5 \\ 3 \end{pmatrix}$

$\Delta = \begin{vmatrix} 5 & 2 & 1 \\ 3 & 2 & 0 \\ 1 & 0 & 2 \end{vmatrix}$ $\quad \Delta_x = \begin{vmatrix} 8 & 2 & 1 \\ 5 & 2 & 0 \\ 3 & 0 & 2 \end{vmatrix}$ $\quad \Delta_y = \begin{vmatrix} 5 & 8 & 1 \\ 3 & 5 & 0 \\ 1 & 3 & 2 \end{vmatrix}$ $\quad \Delta_z = \begin{vmatrix} 5 & 2 & 8 \\ 3 & 2 & 5 \\ 1 & 0 & 3 \end{vmatrix}$

$\Delta = 20 - 14 = 6$

$\Delta_x = 32 - 26 = 6$

$\Delta_y = 59 - 53 = 6$

$\Delta_z = 40 - 34 = 6$

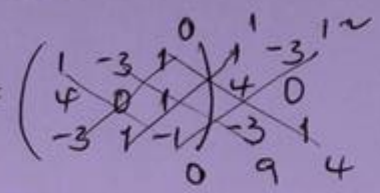
$x = \frac{\Delta_x}{\Delta} = \frac{6}{6} = 1$, $y = \frac{\Delta_y}{\Delta} = \frac{6}{6} = 1$ $\quad z = \frac{\Delta_x}{\Delta} = \frac{6}{6} = 1$

Ans A

28. $A = \begin{pmatrix} 3 & 2 \\ 7 & 5 \end{pmatrix}$ $\det A = 3\cdot 5 - 7\cdot 2$
$= 15 - 14 = 1$

$A^{-1} = \frac{1}{\det A}\begin{pmatrix} 5 & -2 \\ -7 & 3 \end{pmatrix} = \begin{pmatrix} 5 & -2 \\ -7 & 3 \end{pmatrix}$ Ans C

29. $A = \begin{pmatrix} 1 & -3 & 1 \\ 4 & 0 & 1 \\ -3 & 1 & -1 \end{pmatrix}$ $\det A = \begin{pmatrix} 1 & -3 & 1 \\ 4 & 0 & 1 \\ -3 & 1 & -1 \end{pmatrix}$



Coefficient matrix

$= 13 - 13 = 0$

Singular matrix so no solution.

Ans B

30. $A = \begin{pmatrix} k & 2 \\ 5 & -1 \end{pmatrix}$ $\det A = -k - 10$, $\det A \neq 0$ if it have inverse

So $-k - 10 \neq 0$
$-k \neq 10$
$k \neq -10$

$A^{-1} = \frac{1}{\det A}\begin{pmatrix} -1 & -2 \\ -5 & k \end{pmatrix} = \frac{1}{-k-10}\begin{pmatrix} -1 & -2 \\ -5 & k \end{pmatrix}$

$= \frac{1}{k+10}\begin{pmatrix} 1 & 2 \\ 5 & -k \end{pmatrix}$, $k \neq -10$ Ans C

31. $\begin{pmatrix} \alpha & 1 \\ 1 & \beta \end{pmatrix} \cdot \begin{pmatrix} 0 & 1 \\ 1 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

$\Rightarrow \begin{pmatrix} 1 & \alpha + 1 \\ \beta & 1 + \beta \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

$\alpha + 1 = 0$ and $\beta = 0$

$\alpha = -1$

Ans C