



MATHS

NCERT - FULL MARKS MATHS(TAMIL)

APPLICATIONS OF MATRICES AND DETERMINANTS

Exercise 11

1. Find the adjoint of the

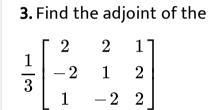
 $\left[\begin{array}{rrr} -3 & 4 \\ 6 & 2 \end{array}\right]$



2. Find the adjoint of the

 $\begin{bmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{bmatrix}$





$$egin{bmatrix} -2 & 4 \ 1 & -3 \end{bmatrix}$$

5. Find the inverse (if it exists) of the

 $\begin{bmatrix} 5 & 1 & 1 \\ 1 & 5 & 1 \\ 1 & 1 & 5 \end{bmatrix}$



6. Find the inverse (if it exists) of the

 $\begin{bmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{bmatrix}$

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7. If adj (A) =
$$\begin{bmatrix} 2 & -4 & 2 \\ -3 & 12 & -7 \\ -2 & 0 & 2 \end{bmatrix}$$
 find A.

8. If adj (A) =
$$\begin{bmatrix} 0 & -2 & 0 \\ 6 & 2 & -6 \\ -3 & 0 & 6 \end{bmatrix}$$
 find A^{-1} .

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9. Find adj (adj (A)) if adj A=
$$\begin{bmatrix} 1 & 0 & 1 \\ 0 & 2 & 0 \\ -1 & 0 & 1 \end{bmatrix}$$

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10. Find the matrix A for which A
$$\begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix} = \begin{bmatrix} 14 & 7 \\ 7 & 7 \end{bmatrix}$$

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11. Given A =
$$\begin{bmatrix} 1 & -1 \\ 2 & 0 \end{bmatrix}$$
, $B = \begin{bmatrix} 3 & -2 \\ 1 & 1 \end{bmatrix}$ and C = $\begin{bmatrix} 1 & 1 \\ 2 & 2 \end{bmatrix}$ find a matrix X such that AXB =C.



12. If A =
$$\begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$
 show that $A^{-1} = \frac{1}{2} (A^2 = 3I).$

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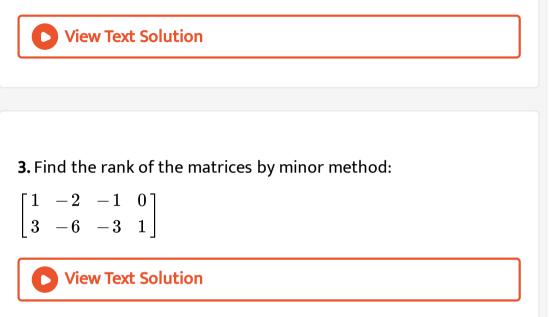
Exercise 12

1. Find the rank of the matrices by minor method:

$$egin{bmatrix} 2 & -4 \ -1 & 2 \end{bmatrix}$$

2. Find the rank of the matrices by minor method:

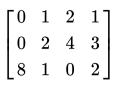
 $\begin{bmatrix} -1 & 3 \\ 4 & -7 \\ 3 & -4 \end{bmatrix}$



4. Find the rank of the matrices by minor method:

$$egin{bmatrix} 1 & -2 & 3 \ 2 & 4 & -6 \ 5 & 1 & -1 \end{bmatrix}$$

5. Find the rank of the matrices by minor method:





6. Find the rank of the matrices by row reduction method:

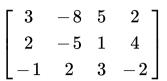
 $egin{bmatrix} 1 & 1 & 1 & 3 \ 2 & -1 & 3 & 4 \ 5 & -1 & 7 & 11 \end{bmatrix}$

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7. Find the rank of the matrices by row reduction method:

 $egin{array}{ccccccc} \cdot 1 & 2 & -1 \ 3 & -1 & 2 \ 1 & -2 & 3 \ 1 & -2 & 3 \ 1 & -1 & 1 \end{array}$

8. Find the rank of the matrices by row reduction method:



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9. Find the inverse of each of the by Gauss-Jordan method:

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

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10. Find the inverse of each of the by Gauss-Jordan method:

$$egin{bmatrix} 1 & -1 & 0 \ 1 & 0 & -1 \ 6 & -2 & -3 \end{bmatrix}$$

11. Find the inverse of each of the by Gauss-Jordan method:



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Exercise 13

1. Solve the system of linear equations by matrix inversion method:

2x+5y=-2, x+2y= -3



2. Solve the system of linear equations by matrix inversion method:

2x -y =8 ,3x +2y= -2

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3. Solve the system of linear equations by matrix inversion method:

2x+3y-z=9, x +y+z=9, 3x-y-z=-1

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4. Solve the system of linear equations by matrix inversion method:

x+y+z-2 =0 , 6x-4y+5z-31=0 , 5x +2y+2z =13

5. If A =
$$\begin{bmatrix} -5 & 1 & 3 \\ 7 & 1 & -5 \\ 1 & -1 & 1 \end{bmatrix}$$
 and B =
$$\begin{bmatrix} 1 & 1 & 2 \\ 3 & 2 & 1 \\ 2 & 1 & 3 \end{bmatrix}$$
 find the productsAB

and BAand hence solve the system of equations x+y+2z = 1,3x+2y+z

=7,2x+y+3z=2.



6. A man is appointed in a job with a monthly salary of certain amount and a fixed amount of annual increment. If his salary was \overline{v} 19,800 per month at the end of the first month after 3 years of service and \overline{v} 23,400 per month at the end of the first month after 9 years of service, find his starting salary and his annual increment. (Use matrix inversion method to solve the problem.) 7. Four men and 4 women can finish a piece of work jointly in 3 days while 2 men and 5 women can finish the same work jointly in 4 days. Find the time taken by one man alone and that of one woman alone to finish the same work by using matrix inversion method.



8. The prices of three commodities AB , and C are रु x,y , and z per units respectively. A person P purchases 4 units of B and sells two units of A and 5 units of C . Person Q purchases 2 units of C and sells 3 units of A and one unit of B. Person R purchases one unit of A and sells 3 unit of B and one unit of C . In the process, PQ , and R earn रु 15,000, रु 1,000 and रु 4,000 respectively. Find the prices per unit of AB , and C . (Use matrix inversion method to solve the problem.)

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Exercise 14

1. Solve the systems of linear equations by Cramer's rule:

5x-2y+16=0, x+3y-7=0

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2. Solve the systems of linear equations by Cramer's rule:

$$rac{3}{x}+2y=12, rac{2}{x}+3y=13$$

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3. Solve the systems of linear equations by Cramer's rule:

4. Solve the systems of linear equations by Cramer's rule:

 $\frac{3}{x} - \frac{4}{x} - \frac{2}{z} - 1 = 0, \frac{1}{x} + \frac{2}{y} + \frac{1}{z} - 2 = 0, \frac{2}{x} - \frac{5}{y} - \frac{4}{z} + 1 = 0$ View Text Solution

5. In a competitive examination, one mark is awarded for every correct answer while $\frac{1}{3}$ mark is deducted for every wrong answer. A student answered 100 questions and got 80 marks. How many questions did he answer correctly ? (Use Cramer's rule to solve the problem).

6. A chemist has one solution which is 50% acid and another solution which is 25% acid. How much each should be mixed to make 10 litres of a 40% acid solution ? (Use Cramer's rule to solve the problem).

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7. A fish tank can be filled in 10 minutes using both pumps A and B simultaneously. However, pump B can pump water in or out at the same rate. If pump B is inadvertently run in reverse, then the tank will be filled in 30 minutes. How long would it take each pump to fill the tank by itself ? (Use Cramer's rule to solve the problem).



8. A family of 3 people went out for dinner in a restaurant. The cost of two dosai, three idlies and two vadais is \overline{v} 150. The cost of the two dosai, two idlies and four vadais is \overline{v} 200. The cost of five dosai, four idlies and two vadais is \overline{v} 250. The family has \overline{v} 350 in hand and they ate 3 dosai and six idlies and six vadais. Will they be able to manage to pay the bill within the amount they had ?





1. Solve the systems of linear equations by Gaussian elimination

method:

2x-2y+3z=2, x+2y-z=3, 3x-y+2z=1

2. Solve the systems of linear equations by Gaussian elimination

method:

2x+4y+6z=22, 3x+8y+5z=27, -x+y+2z=2



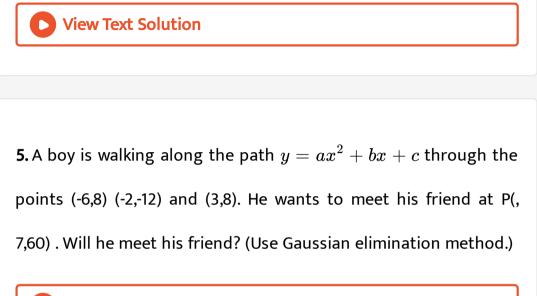
3. If $ax^2 + bx + c$ is divided by x+3, x-5 and x -1 the remainders are

21,61 and 9 respectively. Find a,b and c. (Use Gaussian elimination method.)



4. An amount of रु 65,000 is invested in three bonds at the rates of 6%,8 % and 10% per annum respectively. The total annual income is रु 4,800. The income from the third bond is रु 600 more

than that from the second bond. Determine the price of each bond. (Use Gaussian elimination method.)



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1. Test for consistency and if possible, solve the following systems

of equations by rank method.

x-y+2z+2, 2x+y+4z=7, 4x-y+z=4

2. Test for consistency and if possible, solve the following systems

of equations by rank method.

3x+y+z=2, x-3y+2z=1, 7x-y+4z=5

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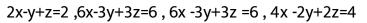
3. Test for consistency and if possible, solve the following systems

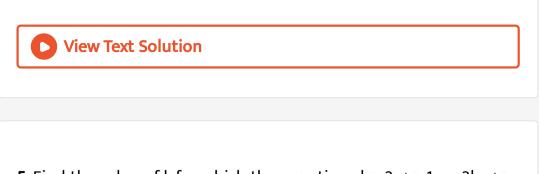
of equations by rank method.

2x+2y+z=5 ,x-y+z=1 ,3x+y+2z=4



4. Test for consistency and if possible, solve the following systems of equations by rank method.





5. Find the value of k for which the equations kx -2y+z=1, x -2ky +z =

-2 , x -2y+kz =1 have

(i) no solution (ii) unique solution (iii) infinitely many solution

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6. Investigate the values of λ and μ the system of linear equations

2x+3y+5z=9 , 7x+3y-5z =8 , 2x +3y+ $\lambda z=\mu$ have

(i) no solution (ii) a unique solution (iii) an infinite number of solutions.



1. Solve the system of homogenous equations.

3x+2y+7z=0, 4x-3y-2z=0, 5x+9y+23z=0

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2. Solve the system of homogenous equations.

2x+3y-z=0 , x-y-2z=0 ,3x+y+3z=0

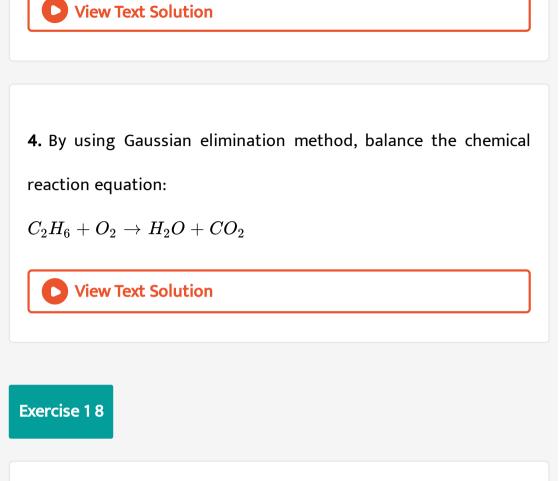
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3. Determine the values of λ for which the following system of

equations

x+y+3z=0 , 4x+3y + $\lambda z=0,\,$ 2x+y+2z=0 has

(i) a unique solution (ii) a non-trivial solution.



1. If $|adj(adj A)| = |A|^9$ then the order of the square matrix A is

A. 3

B. 4

C. 2

D. 5

Answer: B



2. If A is a 3×3 non -singular matrix such that $\forall^T = A^T A$ and $B = A^{(-1)} A^{(T)} then BB^{(T)} =$

A. A

B. B

 $\mathsf{C}.I_3$

 $\mathsf{D}.\,B^T$

Answer: C

3. If
$$A = \begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$$
, B = adj A and C = 3A then $\frac{|adjB|}{|C|} =$
A. $\frac{1}{3}$
B. $\frac{1}{9}$
C. $\frac{1}{4}$
D. 1

Answer: B

4. If A
$$\begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}$$
 then A =
A. $\begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix}$
B. $\begin{bmatrix} 1 & 2 \\ -1 & 4 \end{bmatrix}$
C. $\begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$

 $\mathsf{D}. \begin{bmatrix} 4 & -1 \\ 2 & 1 \end{bmatrix}$

Answer: C

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5. If
$$A = \begin{bmatrix} 7 & 3 \\ 4 & 2 \end{bmatrix}$$
 then $9I_2 - A =$
A. A^{-1}
B. $\frac{A^{-1}}{2}$
C. $3A^{-1}$
D. $2A^{-1}$

Answer: D

6. If
$$A = \begin{bmatrix} 2 & 0 \\ 1 & 5 \end{bmatrix}$$
 and $B = \begin{bmatrix} 1 & 4 \\ 2 & 0 \end{bmatrix}$ then $|adj (AB)|^{*} =$
A. -40
B. -80
C. -60
D. -20

Answer: B

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7. If P =
$$\begin{bmatrix} 1 & x & 0 \\ 1 & 3 & 0 \\ 2 & 4 & -2 \end{bmatrix}$$
 is the adjoint of 3×3 matrix A and $|A| = 4$

then x is

A. 15

B. 12

C. 14

D. 11

Answer: D

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8. If A =
$$[(3, 1, -1), (2, -2, 0), (1, 2-1)]$$
 and

$$A^{-1} = \begin{bmatrix} a_1 & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

A. 0

 $\mathsf{B.}-2$

C. - 3

D. - 1

Answer: D

9. If AB , and C are invertible matrices of some order, then which one of the following is not true?

A. adj A= |A|
$$A^{-1}$$

B. adj (AB) = (adj A) (adjB)

C. det
$$A^{-1} = (\det A)^{-1}$$

D.
$$(ABC)^{-1} = C^{-1}B^{-1}A^{-1}$$

Answer: B

10. If
$$(AB)^{-1} = \begin{bmatrix} 12 & -17 \\ -19 & 27 \end{bmatrix}$$
 and $A^{-1} = \begin{bmatrix} 1 & -1 \\ -2 & 3 \end{bmatrix}$ then $B^{-1} =$

A.
$$[(2, -5), (-, 3, 8)]$$

B. $\begin{bmatrix} 8 & 5 \\ 3 & 2 \end{bmatrix}$
C. $\begin{bmatrix} 3 & 1 \\ 2 & 1 \end{bmatrix}$
D. $\begin{bmatrix} 8 & -5 \\ -3 & 2 \end{bmatrix}$

Answer: A



11. If
$$A^T A^1$$
 is symmetric then A^2 =

A.
$$A^{-1}$$

B. $(A^{T})^{2}$
C. A^{T}
D. $(A^{-1})^{2}$

Answer: B



12. If A is a non-singular matrix such that $A^{-1} = \begin{bmatrix} 5 & 3 \\ -2 & -1 \end{bmatrix}$

then $\left(A^{-T}
ight)^{-1}$ =

A. $\begin{bmatrix} -5 & 3\\ 2 & 1 \end{bmatrix}$ B. $\begin{bmatrix} 5 & 3\\ -2 & -1 \end{bmatrix}$ C. $\begin{bmatrix} -1 & -3\\ 2 & 5 \end{bmatrix}$ D. $\begin{bmatrix} 5 & -2\\ 3 & -1 \end{bmatrix}$

Answer: D

13. If A =
$$\begin{bmatrix} \frac{3}{5} & \frac{4}{5} \\ x & \frac{3}{5} \end{bmatrix}$$
 and $A^T = A^{-1}$ then the value of x is
A. $\frac{-4}{5}$
B. $\frac{-3}{5}$
C. $\frac{3}{5}$
D. $\frac{4}{5}$

Answer: A

14. If A=
$$\begin{bmatrix} 1 & \tan \frac{\theta}{2} \\ -\tan \frac{\theta}{2} & 1 \end{bmatrix}$$
 and AB = I_2 then B =
A. $\left(\cos^2 \frac{\theta}{2}\right)A$
B. $\left(\cos^2 \frac{\theta}{2}\right)A^T$

C.
$$(\cos^2 \theta) I$$

D. $\left(\sin^2 \frac{\theta}{2}\right) A$

Answer: B

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15. If A=
$$\begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix}$$
 and A (adj A) = $\begin{bmatrix} k & 0 \\ 0 & k \end{bmatrix}$ then k =

A. 0

B. sin θ

C. $\cos \theta$

D. 1

Answer: D

16. If
$$A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$$
 be such that $\lambda A^{-1} = A$ then λ is
A. 17
B. 14
C. 19
D. 21

Answer: C

17. If adj A =
$$\begin{bmatrix} 2 & 3 \\ 4 & -1 \end{bmatrix}$$
 and adj B = $\begin{bmatrix} 1 & -2 \\ -3 & 1 \end{bmatrix}$ then adj (AB) is
A. $\begin{bmatrix} -7 & -1 \\ 7 & -9 \end{bmatrix}$
B. $\begin{bmatrix} -6 & 5 \\ -2 & -10 \end{bmatrix}$
C. $[(-7, 7,), (-1, -9)]$

$$\mathsf{D}. \begin{bmatrix} -6 & -2 \\ 5 & -10 \end{bmatrix}$$

Answer: B

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	[1	2	3	4	
18. The rank of the matrix	2	4	6	8	is
18. The rank of the matrix	$\lfloor -1 \rfloor$	-2	-3	-4	

- A. 1
- B. 2
- C. 4
- D. 3

Answer: A

$$x^ay^b=e^m, x^cy^d=e^n, \Delta_1=ig|egin{array}{cc}m&b\n&dig|, \Delta_2=ig|egin{array}{cc}a&m\c&nig|, \Delta_3=ig|egin{array}{cc}a&b\c&dig| c&dig| \end{array}$$

If

then the values of x and y are respectively

A.
$$e^{(\Delta_2 / \Delta_1)}, e^{(\Delta_3 / \Delta_1)}$$

B. log $(\Delta_{1/\Delta_3}, \log (\Delta_2 / \Delta_3))$
C. log $(\Delta_2 / \Delta_1), \log (\Delta_3 / \Delta_1)$
D. $e^{(\Delta_1 / \Delta_3)}, e^{(\Delta_2 / \Delta_3)}$

Answer: D

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20. Which of the following is/are correct?

(i) Adjoint of a symmetric matrix is also a symmetric matrix

(ii) Adjoint of a diagonal matrix is also a diagonal matrix.

(iii) If A is a square matrix of order n and λ is a scalar, then adj $(\lambda A) = \lambda^n$ adj (A).

(iv) A(adjA) = (adjA) = A|A|I

A. Only (i)

B. (ii) and (iii)

C. (iii) and (iv)

D. (i), (ii) and (iv)

Answer: D



21. If $ho(A) =
ho([A \mid B])$ then the system AX =B of linear equations is

A. consistent and has a unique solution

B. consistent

C. consistent and has infinitely many solution

D. inconsistent

Answer: B

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22. If $0 \le \theta \le \pi$ and the system of equations $x + (\sin \theta)y - (\cos \theta)z = 0$ ($\cos \theta$) x - y + z = 0 ($\sin \theta$) x + y - z = 0 has a non - trivial solution then θ is

A.
$$\frac{2\pi}{3}$$

B. $\frac{3\pi}{4}$
C. $\frac{5\pi}{6}$
D. $\frac{\pi}{4}$

Answer: D



23. The augmented matrix of a system of linear equations is $\begin{bmatrix} 1 & 2 & 7 & 3 \\ 0 & 1 & 4 & 6 \\ 0 & 0 & \lambda - 7 & \mu + 5 \end{bmatrix}$. The system has infinitely many solutions if

A.
$$\lambda=7, \mu
eq-5$$

- B. $\lambda=-7, \mu=5$
- C. $\lambda
 eq 7, \mu
 eq -5$

D.
$$\lambda=7, \mu=-5$$

Answer: D

24.	Let	A	=	$\begin{bmatrix} 2\\ -1\\ 1 \end{bmatrix}$	$egin{array}{c} -1 \\ 2 \\ -1 \end{array}$	$\begin{bmatrix} 1\\ -1\\ 2 \end{bmatrix}$	and
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 $4B = [(3,1-1),\,(1,3,x),\,(\,-1,1,3)]$. If B is the iverse of A ,

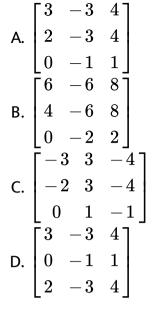
then the value of x is

A. 2 B. 4 C. 3

D. 1

Answer: D

25. If A =
$$\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$$
 then adj (adj A) is



Answer: A

