

## Determinants and Inverses of 3X3 matrices IB SL/HL

For these questions the matrices have been defined as:

$$A = \begin{bmatrix} 1 & 3 & 2 \\ -1 & 2 & -1 \\ 2 & -2 & 3 \end{bmatrix}, B = \begin{bmatrix} 2 & -3 & 2 \\ 1 & 0 & -1 \\ 4 & 5 & 3 \end{bmatrix}, C = \begin{bmatrix} -2 & -3 & 5 \\ 1 & p & 1 \\ -2 & 1 & -1 \end{bmatrix}, D = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}, E = \begin{bmatrix} 2 \\ 3 \\ -1 \end{bmatrix}$$

1. Show that the determinant of matrix  $A = 3$ .
2. Find the value of  $p$  such that  $C$  is a singular, non-zero matrix.
3. State which matrix you obtain when the  $BB^{-1}$ .
4. Solve the following,

- a)  $AB$
- b)  $BA$
- c)  $B^2$
- d)  $AE$
- e)  $EB$

5. Solve the equations,

$$x + 3y + 2z = 15$$

- a)  $-x + 2y - z = 0$

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

$$2x - 3y + 2z = -8$$

- b)  $x - z = 4$

$$4x + 5y + 3z = 29$$

6. Explain why you can not solve,

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

$$x + py - z = 3$$

$$-2x + y - z = 4$$

using matrices.

Assume you are using the value of  $p$ , found in question 2.

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### Solutions

2.  $\rho = -\frac{5}{6}$ .

3.  $D = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

4. a)  $\begin{bmatrix} 13 & 7 & 5 \\ -4 & -2 & -7 \\ 14 & 9 & 15 \end{bmatrix}$

b)  $\begin{bmatrix} 9 & -4 & 13 \\ -1 & 5 & -1 \\ 5 & 16 & 12 \end{bmatrix}$

c)  $\begin{bmatrix} 9 & 4 & 13 \\ -2 & -8 & -1 \\ 25 & 3 & 12 \end{bmatrix}$

d)  $\begin{bmatrix} 9 \\ 5 \\ -5 \end{bmatrix}$

e) Not possible

5. a)  $x = -1, y = 2, z = 5$

b)  $x = 3, y = 4, z = -1$

6. Because matrix C has no inverse, as the determinant is 0.