5.2.23

EE25BTECH11020 - Darsh Pankaj Gajare

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Question:

Using elementary transformations, find inverse of the matrix $\begin{pmatrix} 2 & 1 \\ 7 & 4 \end{pmatrix}$

Solution:

Table

$\mathbf{A}$	$\begin{pmatrix} 2 & 1 \\ 7 & 4 \end{pmatrix}$
$\mathbf{I}$	$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

$$\mathbf{A}\mathbf{A}^{-1} = \mathbf{I} \tag{0.1}$$

Using Augmented matrix,

$$\left(\begin{array}{cc|cc} 2 & 1 & 1 & 0 \\ 7 & 4 & 0 & 1 \end{array}\right) \tag{0.2}$$

$R_2 = R_2 - 3R_1$

$$\left(\begin{array}{cc|cc} 2 & 1 & 1 & 0 \\ 1 & 1 & -3 & 1 \end{array}\right) \tag{0.3}$$

$R_1 = R_1 - R_2$

$$\left(\begin{array}{cc|cc} 1 & 0 & 4 & -1 \\ 1 & 1 & -3 & 1 \end{array}\right) \tag{0.4}$$

$R_2 = R_2 - R_1$

$$\left(\begin{array}{cc|cc} 1 & 0 & 4 & -1 \\ 0 & 1 & -7 & 2 \end{array}\right) \tag{0.5}$$

$$\mathbf{A}^{-1} = \begin{pmatrix} 4 & -1 \\ -7 & 2 \end{pmatrix} \tag{0.6}$$

C function to find inverse of a matrix:

```
int inverse2x2(double mat[4], double inv[4]) {
    double a = mat[0], b = mat[1];
    double c = mat[2], d = mat[3];

    double det = a*d - b*c;
    if(det == 0.0) {
        return -1; // not invertible
    }

    inv[0] = d / det;
    inv[1] = -b / det;
    inv[2] = -c / det;
    inv[3] = a / det;

    return 0; // success
}
```