

Homework - June 22

Section 3.1

4. Cofactor expansion along the first row - $\begin{vmatrix} 1 & 3 & 5 \\ 2 & 1 & 1 \\ 3 & 4 & 2 \end{vmatrix} = 1 \begin{vmatrix} 1 & 1 \\ 4 & 2 \end{vmatrix} - 3 \begin{vmatrix} 2 & 1 \\ 3 & 2 \end{vmatrix} +$

$5 \begin{vmatrix} 2 & 1 \\ 3 & 4 \end{vmatrix} = 1(2 - 4) - 3(4 - 3) + 5(8 - 3) = -2 - 3 + 25 = 20.$

Cofactor expansion down second column - $\begin{vmatrix} 1 & 3 & 5 \\ 2 & 1 & 1 \\ 3 & 4 & 2 \end{vmatrix} = -3 \begin{vmatrix} 2 & 1 \\ 3 & 2 \end{vmatrix} + 1 \begin{vmatrix} 1 & 5 \\ 3 & 2 \end{vmatrix} -$

$4 \begin{vmatrix} 1 & 5 \\ 2 & 1 \end{vmatrix} = -3(4 - 3) + 1(2 - 15) - 4(1 - 10) = -3 - 13 + 36 = 20.$

14. $\begin{vmatrix} 6 & 3 & 2 & 4 & 0 \\ 9 & 0 & -4 & 1 & 0 \\ 8 & -5 & 6 & 7 & 1 \\ 3 & 0 & 0 & 0 & 0 \\ 4 & 2 & 3 & 2 & 0 \end{vmatrix} = 1 \begin{vmatrix} 6 & 3 & 2 & 4 \\ 9 & 0 & -4 & 1 \\ 3 & 0 & 0 & 0 \\ 4 & 2 & 3 & 2 \end{vmatrix} = 3 \begin{vmatrix} 3 & 2 & 4 \\ 0 & -4 & 1 \\ 2 & 3 & 2 \end{vmatrix} =$

$3 \cdot 3 \begin{vmatrix} -4 & 1 \\ 3 & 2 \end{vmatrix} + 3 \cdot 2 \begin{vmatrix} 2 & 4 \\ -4 & 1 \end{vmatrix} = 9(-8 - 3) + 6(2 + 16) = -99 + 108 = 9.$

40. a) False. The determinant is the same no matter if you expand along a row or down a column.

b) False. The determinant of a triangular matrix is the product of the terms on the diagonal.

42. The area of the parallelogram is bc . $|\mathbf{u} \ \mathbf{v}| = -bc$ and $|\mathbf{v} \ \mathbf{u}| = bc$. The area of the parallelogram is the absolute value of the determinant of the matrix.