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Quiz 7

This quiz is graded out of 10 marks. No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. §2.1 #16 *(5 marks)* Find all the values of λ for which $\det(A) = 0$.

$$A = \begin{bmatrix} \lambda - 4 & 0 & 0 \\ 0 & \lambda & 2 \\ 0 & 3 & \lambda - 1 \end{bmatrix}$$

$0 = \det(A)$

$0 = a_{11}C_{11} + a_{12}C_{12} + a_{13}C_{13}$

$0 = (\lambda-4)(-1)^{1+1}\begin{vmatrix} \lambda & 2 \\ 3 & \lambda-1 \end{vmatrix} + 0C_{12} + 0C_{13}$

$0 = (\lambda-4)[\lambda(\lambda-1) - 2(3)]$

$0 = (\lambda-4)[\lambda^2 - \lambda - 6]$

$0 = (\lambda-4)(\lambda-3)(\lambda+2)$

$\lambda - 4 = 0 \quad \lambda - 3 = 0 \quad \lambda + 2 = 0$

$\lambda = 4 \quad \lambda = 3 \quad \lambda = -2$

Question 2. §2.1 #23 *(3 marks)* Evaluate $\det(A)$ by a cofactor expansion along a row or column of your choice.

$$A = \begin{bmatrix} 1 & k & k^2 \\ 1 & k & k^2 \\ 1 & k & k^2 \end{bmatrix}$$

$\det(A) = a_{11}C_{11} + a_{12}C_{12} + a_{13}C_{13}$

$= 1(-1)^{1+1}\begin{vmatrix} k & k^2 \\ k & k^2 \end{vmatrix} + k(-1)^{1+2}\begin{vmatrix} 1 & k^2 \\ 1 & k^2 \end{vmatrix} + k^2(-1)^{1+3}\begin{vmatrix} 1 & k \\ 1 & k \end{vmatrix}$

$= 1(1)[k(k^2) - k^2(k)] + (-1)(k)[1(k^2) - 1(k^2)]$

$+ k^2[1(k) - 1(k)] = 1[0] - k[0] + k^2[0]$

$= 0$

Question 3. §2.1 #31 *(2 marks)* Evaluate the determinant of the given matrix by inspection.

$$\begin{bmatrix} 1 & 2 & 7 & -3 \\ 0 & 1 & -4 & 1 \\ 0 & 0 & 2 & 7 \\ 0 & 0 & 0 & 3 \end{bmatrix} = A$$

$\det(A) = 1(1)(2)(3) = 6$