Name: Y. Lamontagne

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 #18 *(5 marks)* Find all the values of λ for which $\det(A) = 0$.

$$A = \begin{bmatrix} \lambda - 4 & 4 & 0 \\ -1 & \lambda & 0 \\ 0 & 0 & \lambda - 5 \end{bmatrix}$$

$0 = \det(A)$

$0 = a_{31}C_{31} + a_{32}C_{32} + a_{33}C_{33}$

$0 = 0\,C_{31} + 0\,C_{32} + (\lambda-5)(-1)^{3+3}\begin{vmatrix} \lambda-4 & 4 \\ -1 & \lambda \end{vmatrix}$

$0 = (\lambda-5)\left[(\lambda-4)\lambda - (-1)(4)\right]$

$0 = (\lambda-5)\left[\lambda^2 - 4\lambda + 4\right]$

$0 = (\lambda-5)(\lambda-2)(\lambda-2)$

$\lambda = 5 \qquad \lambda = 2 \qquad \lambda = 2$

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

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

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

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

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

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

$$= 0$$

Question 3. §2.1 #32 *(2 marks)* Evaluate the determinant of the given matrix by inspection.

$$\begin{bmatrix} -3 & 0 & 0 & 0 \\ 1 & 2 & 0 & 0 \\ 40 & 10 & -1 & 0 \\ 100 & 200 & -23 & 3 \end{bmatrix} = A$$

$\det(A) = (-3)(2)(-1)(3) = 18$