Dawson College: **Linear Algebra**: 201-105-DW-S05: Fall 2009

Name: Y. Lamontagne
Student ID: ____________

Quiz 3

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. Consider the matrix:

$$A=\begin{bmatrix} 0&1&1&1&9&3&4&1&0&9\\ 0&0&1&1&4&9&2&7&7&9\\ 0&0&0&1&1&4&9&2&7&7\\ 0&0&0&0&1&1&4&9&2&7\\ 0&0&0&0&0&1&1&4&9&2\\ 0&0&0&0&0&0&1&1&4&9\\ 0&0&0&0&0&0&0&1&1&4\\ 0&0&0&0&0&0&0&0&1&1\\ 0&0&0&0&0&0&0&0&0&1\\ 0&0&0&0&0&0&0&0&0&0 \end{bmatrix},\ B=\begin{bmatrix}1&0&0\\0&3&0\\0&0&2\end{bmatrix},\ C=\begin{bmatrix}-1&1&2&\cancel{0}\\0&2&3&\cancel{0}\\ \cancel{1}&\cancel{1}&\cancel{0}&\cancel{2}\\0&2&0&\cancel{0}\end{bmatrix}$$

a. *(2 marks)* Compute det(A) = product of all entries of main diagonal = 0

b. *(3 marks)* Compute det(B^{-3})

c. *(4 marks)* Compute det(C)

d. *(1 mark)* Find all 3×3 diagonal matrices Y that satisfy $Y^2-3Y-4I=0$. $\Leftrightarrow$ $(Y-4I)(Y+I)=0$

$Y=4I$ $\quad$ $Y=-I$

$$=\begin{bmatrix}4&0&0\\0&4&0\\0&0&4\end{bmatrix} \quad = \begin{bmatrix}-1&0&0\\0&-1&0\\0&0&-1\end{bmatrix}$$

b) $B^{-3}=\begin{bmatrix}1^{-3}&0&0\\0&3^{-3}&0\\0&0&2^{-3}\end{bmatrix}=\begin{bmatrix}1&0&0\\0&\frac{1}{27}&0\\0&0&\frac{1}{8}\end{bmatrix}$

$\det(B^{-3})=(1)(\frac{1}{27})(\frac{1}{8})=\frac{1}{216}$

c) $\det(C)=c_{14}C_{14}+c_{24}C_{24}+c_{34}C_{34}+c_{44}C_{44}$

$=0C_{14}+0C_{24}+-2C_{34}+0C_{44}$

$=-2(-1)^{3+4}\begin{vmatrix}-1&1&2\\0&2&3\\ \cancel{0}&\cancel{2}&\cancel{0}\end{vmatrix}$

$=-2(-1)\left[c_{31}C_{31}+c_{32}C_{32}+c_{33}C_{33}\right]$

$=-2(-1)\left[0C_{31}+2C_{32}+0C_{33}\right]$

$=-2(-1)2(-1)^{3+2}\begin{vmatrix}-1&2\\0&3\end{vmatrix} = -2(-1)(2)(-1)(-3)$

$=12$