

MAT 1302 – Winter 2012

Assignment 4

Professor: Alistair Savage

Due date: 5:00am, 7 April 2012

You must show your work in order to receive full marks. In particular, you must show each step in any row reduction and state what operation you are performing at each step.

Assignments must be submitted online on Virtual Campus. They must be typewritten, submitted in PDF format, and have the filename “XXXXXX-a4.pdf”, where XXXXXX is your student number. Assignments not meeting these conditions will not be graded. See

<http://www.mathstat.uottawa.ca/~asavag2/mat1302/assignments.html>

for detailed instructions on preparation and submission.

QUESTION 1. (**5 points**) Let $z = -1 - 2i$, $w = 1 + 3i$ and $c = -4$. Compute the following and write them in the form $a + bi$, with $a, b \in \mathbb{R}$.

- (a) $3z - 4w$
- (b) $z\bar{w}$
- (c) $\frac{\bar{z}}{w}$
- (d) $|czt|$

QUESTION 2. Let $A = \begin{bmatrix} 3 & -1 & -1 \\ -1 & 3 & -1 \\ -1 & -1 & 3 \end{bmatrix}$.

- (a) (**4 points**) Find the characteristic polynomial of A . List the eigenvalues of A , together with their multiplicities.
- (b) (**4 points**) For each eigenvalue of A , find a basis of the corresponding eigenspace.
- (c) (**2 points**) If possible, diagonalize the matrix A . That is, find a diagonal matrix D and an invertible matrix P such that $A = PDP^{-1}$. (Note: You do *not* need to find P^{-1} .)