CS1003 Homework I

This homework will be marked out of 10.
Please write your **NAME** and **CS1003** on the top of the first page.
Submit your solution online via the CS1003 page on mymodule.tcd.ie. Your
assignment should be sumitted by **8pm on Thursday 20th September**.

Q1 (4 marks)

If $A = \begin{pmatrix} 1 & 5 \\ 2 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 4 \\ 2 & 3 \end{pmatrix}$,

  (i) Find $\det A$ and $\det B$ (i.e. find the determinant of each matrix).

  (ii) Show that
$$(AB)^T = B^T A^T$$

Q2 (3 marks)

If $A = \begin{pmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 2 & 1 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 2 & 2 \\ 2 & 5 & 3 \\ 2 & 1 & 1 \end{pmatrix}$,

  (i) Calculate the matrix products AB and BA.

  (ii) Is $AB = BA$? If not give a reason why not.

Q3 (3 marks)

Solve the following system of linear equations using Gaussian Elimination:

$$
\begin{aligned}
x + y + z &= 2 \\
2x + 3y + 1z &= 3 \\
x - y - 2z &= -6
\end{aligned}
$$

Note that Gaussian Elimination is another name for Gauss-Jordan elimination where we
reduce an augmented matrix to reduced row echelon form in order to find the solution of
a system of equations. You must use this method to obtain any marks for this question.

**Note: To obtain full marks you will need to lay your work out in clear logical
steps so that the reader can see exactly how you obtain one line from the
previous one. You should show all your workings clearly, in particular please
use equal signs where appropriate. Don't be afraid to use sentences in En-
glish to help explain what you are doing and why. Remember that Gaussian
Elimination/Gauss-Jordan elimination requires you to reduce the matrix to
reduced row echelon form.**

Homework Submission: Submit your work as a **SINGLE PDF FILE**. Please submit
handwritten work that you have scanned or taken photos of. Remember to combine
your scanned files into a single pdf if necessary. Typeset work (e.g. that created using
LaTeX or Microsoft Word with equation editor) will only be allowed in execptional
circumstances – please email Meriel.Huggard@tcd.ie to obtain permission to typset your
work.