School of Mathematics and Statistics

MAST10007 Linear Algebra, Semester 1 2020

Written assignment 2

Submit your assignment online in Canvas before 12 noon on Monday 30th March.
You must write your **name**, **student number**, **tutor's name**, and your **tutorial day/time** on the front page.

- This assignment is worth $1\frac{1}{9}\%$ of your final MAST10007 mark.
- Assignments should be neatly handwritten in blue or black pen, then submitted as a single pdf file. (See instructions on the Written Assignments page under Modules on Canvas.)
- Full working, including row operations used, must be shown in your solutions.
- Marks may be deducted in every question for incomplete working, insufficient justification of steps and incorrect mathematical notation.
- You must use methods taught in MAST10007 Linear Algebra to solve the assignment questions.

1. (a) Evaluate $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$, where $a, b, c \in \mathbb{R}$. Factor your result as much as possible.

   (b) Use the result in part (a) to show that for any three points in the xy-plane $\mathbb{R}^2$ with pairwise distinct x-coordinates there exits a unique curve of the form $y = \alpha + \beta x + \gamma x^2$ passing through them.

2. Consider the points $P(1, -1, -2)$, $Q(2, 1, 1)$, $R(1, 2, 1)$ and the origin O in $\mathbb{R}^3$. Using vector methods, find

   (a) *all* unit vectors parallel to $\overrightarrow{PQ}$,

   (b) the projection of $\overrightarrow{QR}$ onto $\overrightarrow{PQ}$,

   (c) the volume of the parallelepiped defined by $\overrightarrow{OP}$, $\overrightarrow{OQ}$ and $\overrightarrow{OR}$.