Submit your assignment online in Canvas before 12 noon on Monday May 4.
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.

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1. In each part of this question, decide whether W is a subspace of the real vector space V. For each part, give a complete proof using the subspace theorem, or a specific counterexample to show that some subspace property fails.

   (a) $V = \mathcal{P}_2$, $W = \{\mathbf{p} \in \mathcal{P}_2 : \mathbf{p}(0) + \mathbf{p}(2) = 1\}$

   (b) $V = M_{2,2}$, $W = \{A \in M_{2,2} : A^T = A\}$, where A^T denotes the transpose of A.

   (c) $V = \mathbb{R}^3$, $W = \{(x, y, z) \in \mathbb{R}^3 : z^2 = x^2 + y^2\}$

2. Decide whether the following set of polynomials in $\mathcal{P}_3$ is linearly dependent. If so, write one polynomial as a linear combination of the others.

$$\{1 + 2x - x^2 + 3x^3, 2 + 3x + x^2 + 4x^3, 1 + 5x^2 - x^3\}$$