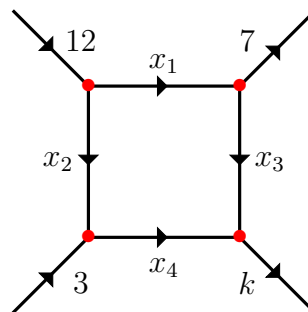


School of Mathematics and Statistics
MAST10007 Linear Algebra, Semester 1 2020
Written assignment 1

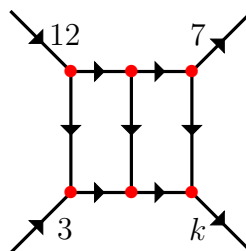
Submit your assignment online in Canvas before 12 noon on Monday 23rd March. You must write your **name**, **student number**, **tutor's name**, and your **tutorial day/time** on the front page.

- This assignment is worth $1\frac{1}{9}\%$ of your final MAST10007 mark.
- Assignments should be neatly handwritten in blue or black pen on A4 paper, then submitted as a single pdf file. (See instructions on the Written Assignments page under Modules on Canvas.)
- You must complete the plagiarism declaration on Canvas before submitting your assignment.
- Full working 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. Consider the following flow diagram where the flow into any vertex must equal the flow out.



- (a) Write down the equations corresponding to the flow at each of the vertices.
- (b) Find the values of $k \in \mathbb{R}$ for which the system in part (a) is (i) consistent and (ii) inconsistent, by reducing the augmented matrix to row-echelon form. For (i) find the general solution.
- (c) Add an extra path to the the flow diagram as shown below. For the value(s) of k in (b)(i) show that the new system is consistent. (Hint: You can answer this question without setting up the linear system.)



2. (a) Use row operations to find the inverse of

$$A = \begin{bmatrix} 1 & 1 & -1 \\ 1 & -1 & 1 \\ -1 & 1 & 1 \end{bmatrix}.$$

(b) In part (a), your implementation of the algorithm should have produced

$$[A|I] \sim [A_1|B_1] \sim \dots \sim [A_m|B_m] \sim [I|B].$$

Choose any intermediate augmented matrix $[A_k|B_k]$ (not $[A|I]$ or $[I|B]$.) Calculate $B_k A - A_k$.