

1. a) Find the value(s) of h such that the following system is **consistent**.

$$\left[\begin{array}{cc|c} 7 & -2 & h \\ -21 & 6 & 8 \end{array} \right]$$

- b) Find the value(s) of h such that the following system has **infinitely many solutions**.

$$\left[\begin{array}{cc|c} 5 & -4 & 7 \\ 10 & h & 14 \end{array} \right]$$

2. For what value(s) of the constant k does each of the following systems have (i) no solution, (ii) infinitely many solutions, (iii) a unique solution?

a)
$$\begin{aligned} kx + y + z &= 1 \\ x + ky + z &= 1 \\ x + y + kz &= 1 \end{aligned}$$

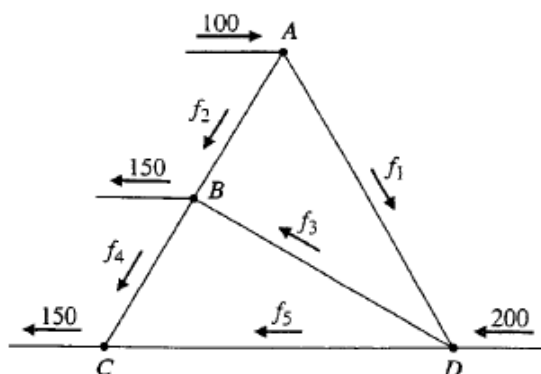
b)
$$\begin{aligned} x + 2y &= 1 \\ 2x + (a^2 - 5)y &= a - 1 \end{aligned}$$

(Hint: Begin with interchanging row 1 with row 3.)

3. From text book **LINEAR ALGEBRA**, Marianopolis College, page 73, **number 42**.

4. A network of irrigation ditches is shown in the diagram with flows measured in thousands of liters per day.

- a) Set up and solve **a system of linear equations** to find the possible flows $f_1, \dots, f_5$.
- b) Suppose DC is closed. What are the **smallest** and the **largest** possible values for the flow DB ?
- c) From the diagram it is clear that DB cannot be closed. (Why not?) How does your solution in part (a) show this?



5. Answer **T**ue or **F**alse to each statement. **If False**, briefly **justify your answer** or give a counter example.
- a) If a matrix is in **rref** it is also in **ref**.
 - b) A column in a matrix in **ref** can contain two leading 1's.
 - c) If every column of a matrix in **rref** has a leading 1, then all the other entries in the matrix are zero.
 - d) A linear system with as many equations as variables has exactly one solution.
 - e) A homogeneous linear system with fewer equations than variables always has infinitely many solutions.
 - f) If the **RREF** of the augmented matrix of a homogeneous linear system with three equations and three variables has a row of zeros, then the system has infinitely many solutions.