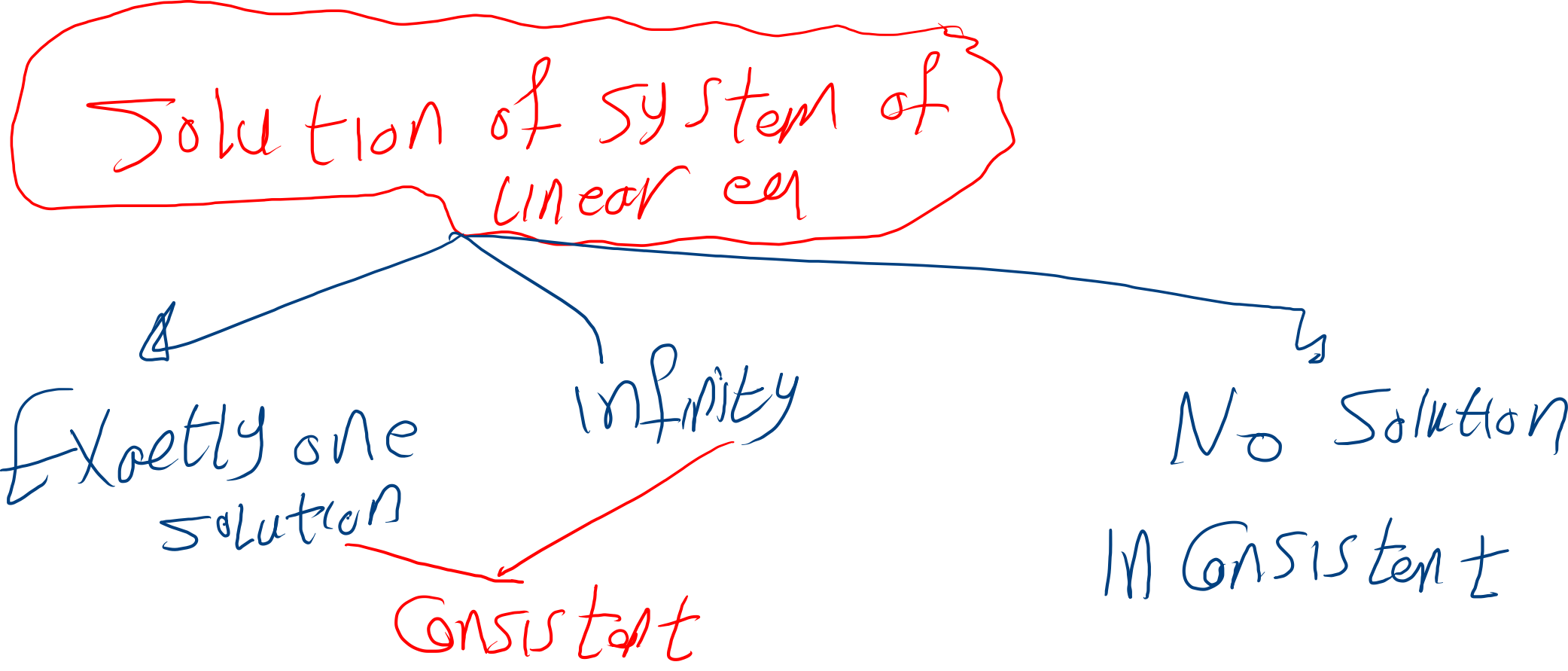
Math 241 sec 1

Linear equation

$x + y = 3$ is lin

$x^2 + y = 5$ not lin

$xy + z = 2$


Solution of system of linear eq
Exactly one solution
Infinity
No Solution
Consistent
Inconsistent

In Exercises 1 through 14, solve each given linear system by the method of elimination.

3. $3x + 2y + z = 2$
$4x + 2y + 2z = 8$
$x - y + z = 4$

Sol

eq(1) ⟷ eq(3)

$x - y + z = 4$
$4x + 2y + 2z = 8$
$3x + 2y + z = 2$

$-4 \times eq(1) + eq(2) = eq(2)$

$x - y + z = 4$
$0 + 6y - 2z = -8$
$3x + 2y + z = 2$

$-3 \times eq(1) + eq(3) = eq(3)$

$x - y + z = 4$
$6y - 2z = -8$
$5y - 2z = -10$

$\frac{1}{6} \times eq(2) = eq(2)$

$x - y + z = 4$
$y - \frac{1}{3}z = \frac{-4}{3}$
$5y - 2z = -10$

$$x - y + z = 4$$

$$y - \frac{1}{3}z = \frac{-4}{3}$$

$$5y - 2z = -10$$

$-5 \times eq(2) + eq(3) = eq(3)$

$$x - y + z = 4$$

$$y - \frac{1}{3}z = \frac{-4}{3}$$

$$0 - \frac{1}{3}z = \frac{-10}{3}$$

From eq(3)

$$\frac{-1}{3}z = \frac{-10}{3}$$

$$\boxed{z = 10}$$

From eq(2)

$$y - \frac{1}{3}z = \frac{-4}{3}$$

$z \to 10$

$$y - \frac{10}{3} = \frac{-4}{3}$$

$$\boxed{y = 2}$$

From eq (1)

$$x - y + z = 4$$

$y \to 2$, $z \to 10$

$$x - 2 + 10 = 4$$

$$\boxed{x = -4}$$

5. $2x + 4y + 6z = -12$
$2x - 3y - 4z = 15$
$3x + 4y + 5z = -8$

Sol

$\frac{1}{2} \times eq(1) = eq(1)$

$x + 2y + 3z = -6$
$2x - 3y - 4z = 15$
$3x + 4y + 5z = -8$

$-2 \times eq(1) + eq(2) = eq(2)$

$x + 2y + 3z = -6$
$0 - 7y - 10z = 27$
$3x + 4y + 5z = -8$

$-3 \times eq(1) + eq(3) = eq(3)$

$x + 2y + 3z = -6$
$-7y - 10z = 27$
$-2y - 4z = 10$

$eq(2) \longleftrightarrow eq(3)$

$x + 2y + 3z = -6$
$-2y - 4z = 10$
$-7y - 10z = 27$

$-\frac{1}{2} \times eq(2) = eq(2)$

$x + 2y + 3z = -6$

$-2y - 4z = 10$

$-7y - 10z = 27$

$-\frac{1}{2} \times eq(2) = eq(2)$

$x + 2y + 3z = -6$

$y + 2z = -5$

$-7y - 10z = 27$

$7 \times eq(2) + eq(3) = eq(3)$

$x + 2y + 3z = -6$

$y + 2z = -5$

$4z = -8$

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eq(3) $4z = -8$

$\boxed{z = -2}$

From eq(2) $y + 2z = -5$

$y - 4 = -5$

$\boxed{y = -1}$

from eq(1)

$$x + 2y + 3z = -6$$

$y = -1$, $z = -2$

$$x - 2 - 6 = -6$$

$$\boxed{x = 2}$$

H.W

$$\begin{aligned} 2x - 3y + 4z &= -12 \\ x - 2y + z &= -5 \\ 3x + y + 2z &= 1 \end{aligned}$$

$x = 1, \quad y = 2, \quad z = -2$

Final Answer

Solve $x+y=5$

So $y = 5 - x$

let $x = t$ $t \in \mathbb{R}$

$y = 5 - t$

(T) 7. $x + 4y - z = 12$
$3x + 8y - 2z = 4$

Sol $-3 \times eq(1) + eq(2) = eq(2)$

$x + 4y - z = 12$
$0 - 4y + z = -32$

From eq(2) $-4y + z = -32$

$-4y = -32 - z$

$y = 8 + \frac{1}{4} z$

from eq (1) $x + 4y - z = 12$

$x + 32 + z - z = 12$

$x = -20$

let $z = t$ $\rightarrow$ $y = 8 + \frac{1}{4} t$

INFINITY Solution

H.W

8. $3x + 4y - z = 8$
$6x + 8y - 2z = 3$

(T) **16.** Given the linear system

$$3x + 4y = s$$
$$6x + 8y = t,$$

(a) Determine particular values for s and t so that the system is consistent.

(b) Determine particular values for s and t so that the system is inconsistent.

(c) What relationship between the values of s and t will guarantee that the system is consistent?

Sol

$3x + 4y = s$ eq(1)

$6x + 8y = t$ eq(2)

$-2 \times eq(1) + eq(2) = eq(2)$

$3x + 4y = s$

$0 + 0 = -2s + t$

the system is consistent

$-2s + t = 0$

(c) $\boxed{t = 2s}$ relation

system consistent

1 (a) particular values

take $s = 1$, $t = 2$

(b) system is inconsistent

$-2s + t \neq 0$

$t \neq 2s$

particular values take $s = 1$, $t = 3$