

Linear Algebra 1.1 Homework

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Instructor: Prof. Knight

3. Not linear

5. Not linear

9.

$$y \rightarrow s$$

$$z \rightarrow t$$

$$S = \{(1 - s - t, s, t)\}$$

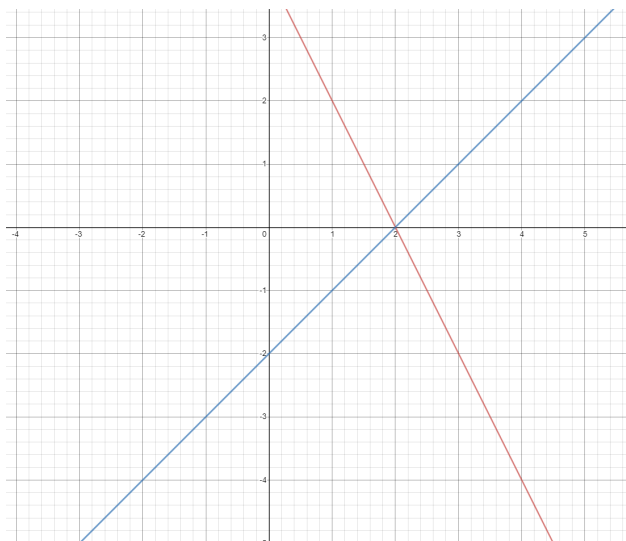
10.

$$x_2 \rightarrow s$$

$$x_3 \rightarrow t$$

$$S = \{(1 - 2s + 3t, s, t)\}$$

11.



$$2x + y = 4 \quad L_1$$

$$x - y = 2 \quad L_2$$

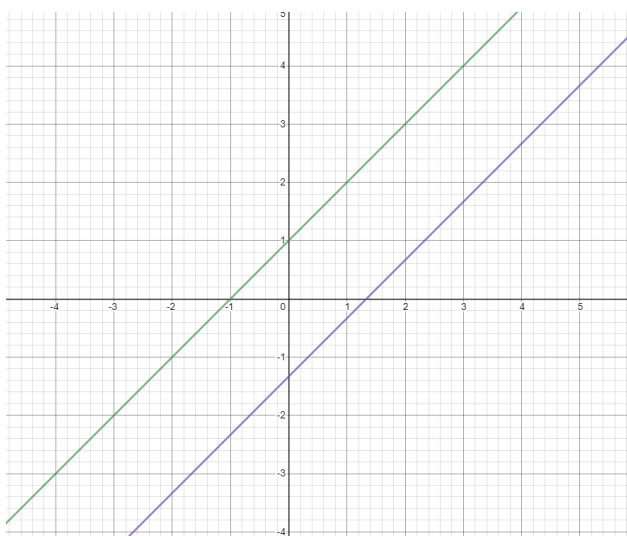
$$L_1 - L_2 \rightarrow x = 2$$

$$2(2) + y = 4$$

$$y = 0$$

The solution is at point $(2, 0)$

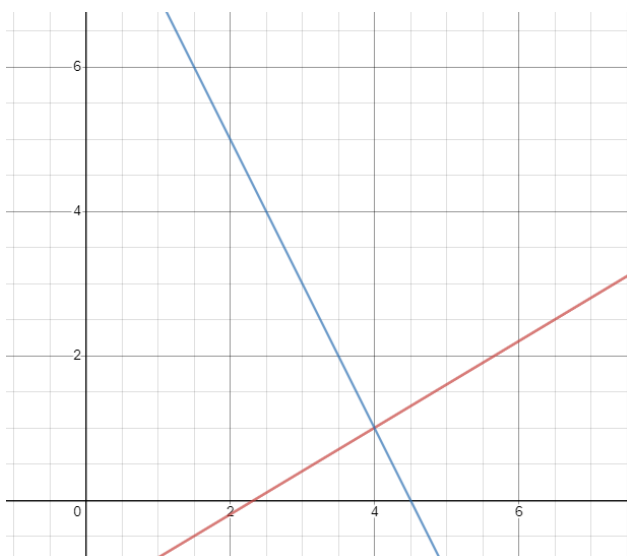
13.



$$\begin{aligned} -x + y &= 1 & L_1 \\ 3x - 3y &= 4 & L_2 \\ -\frac{1}{3}L_2 &\rightarrow -x + y = -\frac{4}{3} \end{aligned}$$

No Solution, Lines Parallel

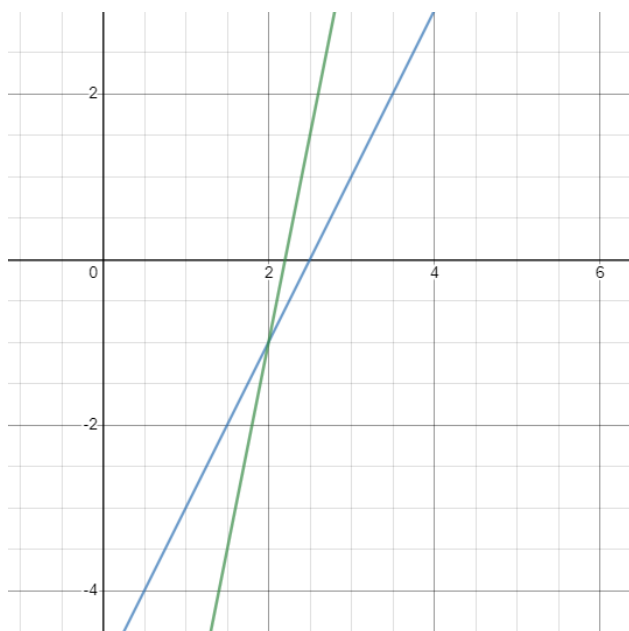
15.



$$\begin{aligned} 3x - 5y &= 7 & L_1 \\ 2x + y &= 9 & L_2 \\ 5L_2 + L_1 &\rightarrow 13x = 52 \\ x &= 4 \\ 2(4) + y &= 9 \\ y &= 1 \end{aligned}$$

The solution is at point $(4, 1)$

17.



$$2x - y = 5 \quad L_1$$

$$5x - y = 11 \quad L_2$$

$$L_2 - L_1 \rightarrow 3x = 6$$

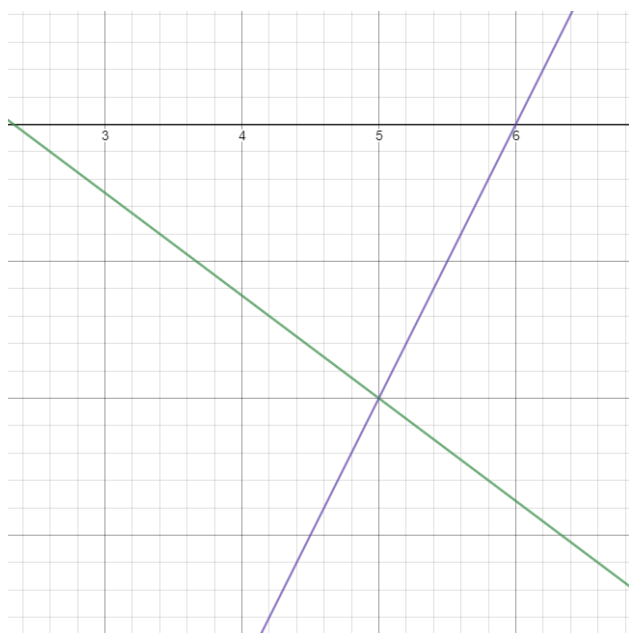
$$x = 2$$

$$2(2) - y = 5$$

$$y = -1$$

The solution is at point $(2, -1)$

19.



$$\frac{x+3}{4} + \frac{y-1}{3} = 1 \quad L_1$$

$$2x - y = 12 \quad L_2$$

$$12L_1 \rightarrow 3x + 4y = 7$$

$$4L_2 + (3x + 4y = 7) \rightarrow 11x = 55$$

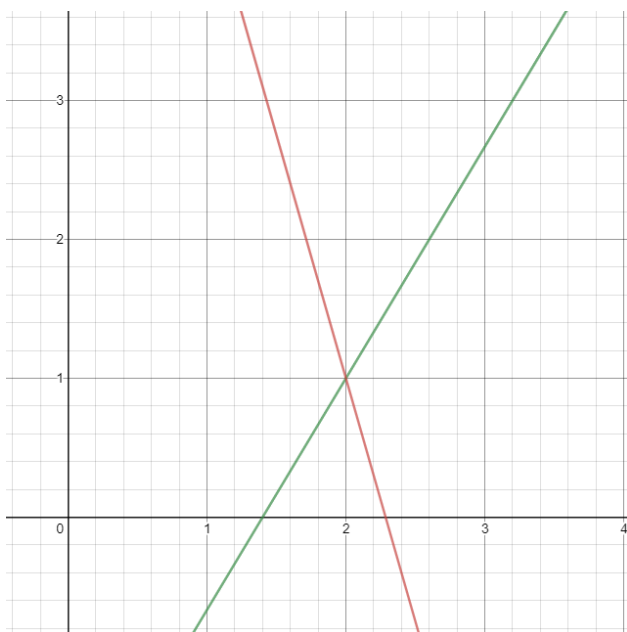
$$x = 5$$

$$2(5) - y = 12$$

$$y = -2$$

The solution is at point $(5, -2)$

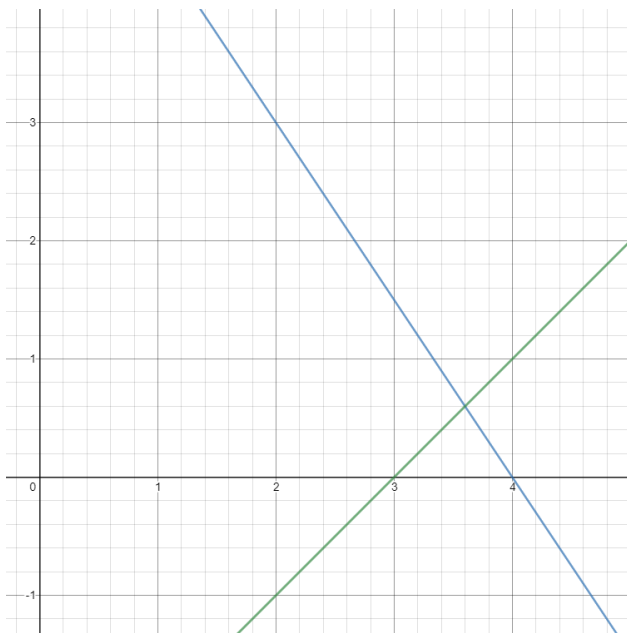
21.



$$\begin{aligned} .05x - .03y &= .07 & L_1 \\ .07x + .02y &= .16 & L_2 \\ 200L_1 + 300L_2 &\rightarrow 31x = 62 \\ x &= 2 \\ .05(2) - .03y &= .07 \\ y &= 1 \end{aligned}$$

The solution is at point (2, 1)

23.



$$\begin{aligned} \frac{x}{4} + \frac{y}{6} &= 1 & L_1 \\ x - y &= 3 & L_2 \\ 24L_1 &\rightarrow 6x + 4y = 24 \\ 4L_2 + (6x + 4y = 24) &\rightarrow 10x = 36 \\ x &= 3.6 \\ -y &= 3 - 3.6 \\ y &= .6 \end{aligned}$$

The solution is at point (3.6, 0.6)

25.

$$\begin{cases} x_1 - x_2 = 2 \\ x_2 = 3 \end{cases} \rightarrow x_1 = 2 + 3 \rightarrow x_1 = 5$$

$$S = \{(5, 3)\}$$

27.

$$\begin{cases} -x + y - z = 0 \\ 2y + z = 3 \\ \frac{1}{2}z = 0 \end{cases} \rightarrow z = 0 \rightarrow 2y = 3 \rightarrow y = \frac{3}{2} \rightarrow -x = -\frac{3}{2} \rightarrow x = \frac{3}{2}$$

$$S = \left\{ \frac{3}{2}, \frac{3}{2}, 0 \right\}$$

$$29. \quad \boxed{\begin{array}{l} 5x_1 + 2x_2 + x_3 = 0 \\ 2x_1 + x_2 = 0 \end{array}} \rightarrow x_1 = -\frac{x_2}{2} \rightarrow x_3 = t \rightarrow x_2 = 2t \rightarrow x_3 = -t$$

$$S = \{-t, 2t, t\}$$

39.

$$3u + v = 240 \quad L_1$$

$$u + 3v = 240 \quad L_2$$

$$3L_2 - L_1 \rightarrow 8v = 480$$

$$v = 60$$

$$u = \frac{240 - 60}{3}$$

$$u = 60$$

The solution is at point (60, 60)

41.

$$9x - 3y = -1 \quad L_1$$

$$\frac{1}{5}x + \frac{2}{5}y = -\frac{1}{3} \quad L_2$$

$$45L_2 - L_1 \rightarrow 21y = -14$$

$$y = -\frac{2}{3}$$

$$9x + 2 = -1$$

$$x = -\frac{1}{3}$$

The solution is at point $\left(-\frac{1}{3}, -\frac{2}{3}\right)$

47.

$$x - y - z = 0 \quad L_1$$

$$x + 2y - z = 6 \quad L_2$$

$$2x - z = 5 \quad L_3$$

$$x - z = y$$

$$2y + y = 6 \rightarrow y = 2$$

$$x - z = 2 \quad L_4$$

$$2x - z = 5 \quad L_5$$

$$L_5 - L_4 \rightarrow x = 3$$

$$z = 1$$

The solution is at point (3, 2, 1)

49.

51.

53.

65.

69.

71.

75.

77.

79.

81.

83.

85.