

MathCon

The Mathematics Firm

Sistemas de Ecuaciones Lineales Homogéneas

100 Problemas de Sistemas de Ecuaciones Lineales Homogéneas

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Contenido

1. Sistemas de Ecuaciones Lineales Homogéneas

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Sistemas de Ecuaciones Lineales Homogéneas

Resolver los siguientes sistemas de ecuaciones lineales homogéneas.

1.

$$\begin{aligned}8x + 2y &= 0 \\4x + y &= 0\end{aligned}$$

Solución $(-r/4, r)$

2.

$$\begin{aligned}-x - 3y &= 0 \\2x + 6y &= 0\end{aligned}$$

Solución $(-3r, r)$

3.

$$\begin{aligned}9x - 3y &= 0 \\6x - 2y &= 0\end{aligned}$$

Solución $(r/3, r)$

4.

$$2x - y - z = 0$$

$$x - y + 2z = 0$$

$$2x - y - z = 0$$

Solución $(3r, 5r, r)$

5.

$$2x + y + z = 0$$

$$x - y + 2z = 0$$

$$2x + y + z = 0$$

Solución $(-r, r, r)$

6.

$$-x + y - z = 0$$

$$-x + y - z = 0$$

$$2x + 2y - z = 0$$

Solución $(-\frac{r}{4}, \frac{3r}{4}, r)$

7.

$$2x + 2y - z = 0$$

$$2x + 2y - z = 0$$

$$x + 2y + z = 0$$

Solución $(2r, -\frac{3r}{2}, r)$

8.

$$2x + 2y - z = 0$$

$$-x + 2y + z = 0$$

$$-x + 2y + z = 0$$

Solución $(\frac{2r}{3}, -\frac{r}{6}, r)$

9.

$$\begin{aligned} -2x - 2y + 2z &= 0 \\ -x + y + 2z &= 0 \\ x + y - z &= 0 \end{aligned}$$

Solución $(\frac{3r}{2}, -\frac{r}{2}, r)$

10.

$$\begin{aligned} -x - 2y - 2z &= 0 \\ x + 2y + z &= 0 \\ -x - 2y + z &= 0 \end{aligned}$$

Solución $(r, -\frac{r}{2}, 0)$

11.

$$\begin{aligned} -2x + y + 2z &= 0 \\ -2x + 2y + 2z &= 0 \\ x - 2y - z &= 0 \end{aligned}$$

Solución $(r, 0, r)$

12.

$$\begin{aligned} -2x - 2y - 2z &= 0 \\ 2x - y - 2z &= 0 \\ x + y + z &= 0 \end{aligned}$$

Solución $(\frac{r}{3}, -\frac{4r}{3}, r)$

13.

$$\begin{aligned} x + 2y + z &= 0 \\ x - y - z &= 0 \\ x + 2y + z &= 0 \end{aligned}$$

Solución $(\frac{r}{3}, -\frac{2r}{3}, r)$

14.

$$-2x - 2y + 9z = 0$$

$$4x \quad \quad + 9z = 0$$

$$-2x - 2y + 9z = 0$$

Solución $(-\frac{9r}{4}, \frac{27r}{4}, r)$

15.

$$x + y + 2z = 0$$

$$x + 2y - z = 0$$

$$x + y + 2z = 0$$

Solución $(-5r, 3r, r)$

16.

$$4y + 6z = 0$$

$$9x + 2y - z = 0$$

$$9x + 4y + 2z = 0$$

Solución $(\frac{4r}{9}, -\frac{3r}{2}, r)$

17.

$$2x - 10y + 6z = 0$$

$$x - 5y + 3z = 0$$

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

Solución $(-\frac{4r}{13}, \frac{7r}{13}, r)$

18.

$$-2x - 6y + 9z = 0$$

$$-8x + 3y - 9z = 0$$

$$-4x \quad \quad - 2z = 0$$

Solución $(-\frac{r}{2}, \frac{5r}{3}, r)$

19.

$$\begin{aligned}4x &+ z = 0 \\-5x - 3y + 5z &= 0 \\-x - 3y + 6z &= 0\end{aligned}$$

Solución $(-\frac{r}{4}, \frac{25r}{12}, r)$

20.

$$\begin{aligned}-3x + 4y + 3z &= 0 \\5x - 2y + 5z &= 0 \\4x - 3y + z &= 0\end{aligned}$$

Solución $(-\frac{13r}{7}, -\frac{15r}{7}, r)$

21.

$$\begin{aligned}4x + 4y + 6z &= 0 \\-2x + y + 6z &= 0 \\-2x - 2y - 3z &= 0\end{aligned}$$

Solución $(\frac{3r}{2}, -3r, r)$

22.

$$\begin{aligned}-3x + 4y + 3z &= 0 \\5x - 2y + 5z &= 0 \\4x - 3y + z &= 0\end{aligned}$$

Solución $(-\frac{13r}{7}, -\frac{15r}{7}, r)$

23.

$$\begin{aligned}-3x + 9y - 3z &= 0 \\7x + 2y + 9z &= 0 \\6x + 5y + 8z &= 0\end{aligned}$$

$$\text{Solución } \left(-\frac{29r}{23}, -\frac{2r}{23}, r\right)$$

24.

$$\begin{aligned}7x + 4y - 3z &= 0 \\6x + 2y - 3z &= 0 \\-x + 8y + 3z &= 0\end{aligned}$$

$$\text{Solución } \left(\frac{3r}{5}, -\frac{3r}{10}, r\right)$$

25.

$$\begin{aligned}6x - 2y + 3z &= 0 \\6x - 2y + 3z &= 0 \\7x - 5y - 4z &= 0\end{aligned}$$

$$\text{Solución } \left(-\frac{23r}{16}, -\frac{45r}{16}, r\right)$$

26.

$$\begin{aligned}-5x + 5y - 2z &= 0 \\8x + 7y + 3z &= 0 \\8x + 7y + 3z &= 0\end{aligned}$$

$$\text{Solución } \left(-\frac{29r}{75}, \frac{r}{75}, r\right)$$

27.

$$\begin{aligned}-4x + 2y + 3z &= 0 \\4x - 2y - 3z &= 0 \\6x + 3y + 7z &= 0\end{aligned}$$

$$\text{Solución } \left(-\frac{5r}{24}, -\frac{23r}{12}, r\right)$$

28.

$$\begin{aligned}x - 3y - 3z &= 0 \\8x + 7y + 2z &= 0 \\-x + 3y + 3z &= 0\end{aligned}$$

$$\text{Solución } \left(\frac{15r}{31}, -\frac{26r}{31}, r\right)$$

29.

$$\begin{aligned}-5x + 3y + 8z &= 0 \\4x + 4y + z &= 0 \\-x + 7y + 9z &= 0\end{aligned}$$

$$\text{Solución } \left(\frac{29r}{32}, -\frac{37r}{32}, r\right)$$

30.

$$\begin{aligned}-x + y + 2z + w &= 0 \\x + y - z + w &= 0 \\2x + y - z + w &= 0\end{aligned}$$

$$\text{Solución } (-r, -r, -r, r)$$

31.

$$\begin{aligned}x + y + 2z + w &= 0 \\-x - y - z + w &= 0 \\-x + 2y + z + 2w &= 0\end{aligned}$$

$$\text{Solución } (2r, r, -2r, r)$$

32.

$$\begin{aligned}-x + y + 2z - w &= 0 \\x - y + 2z - w &= 0 \\-x - y - z + 2w &= 0\end{aligned}$$

$$\text{Solución } \left(\frac{3r}{4}, \frac{3r}{4}, \frac{r}{2}, r\right)$$

33.

$$-x + 2y + z - w = 0$$

$$-x + 2y + z - w = 0$$

$$x - y - z + 2w = 0$$

Solución $(-3r + s, -r, s, r)$

34.

$$-x + 7y + 9z + 3w = 0$$

$$2x + 6z + 2w = 0$$

$$x + 5y + 7z + 2w = 0$$

Solución $(\frac{7r}{32}, \frac{r}{8}, -\frac{13r}{32}, r)$

35.

$$2x + 7y + 9z + 6w = 0$$

$$8x + 2z + 6w = 0$$

$$x + 5y + 7z + w = 0$$

Solución $(-\frac{35r}{19}, -\frac{113r}{19}, \frac{83r}{19}, r)$

36.

$$x + 7y - z + 2w = 0$$

$$8x + 4y + 4z + 5w = 0$$

$$2x + 6y + z + w = 0$$

Solución $(-\frac{73r}{60}, \frac{r}{20}, \frac{17r}{15}, r)$

37.

$$6x - y + 4z + 8w = 0$$

$$7x + 3y + 3w = 0$$

$$6x + 3y + 8z = 0$$

Solución $(-\frac{63r}{53}, \frac{94r}{53}, \frac{12r}{53}, r)$

38.

$$\begin{aligned} 6x - y + 4z + 8w &= 0 \\ 7x + 3y &+ 3w = 0 \\ 6x + 3y + 8z &= 0 \end{aligned}$$

$$\text{Solución } \left(-\frac{63r}{53}, \frac{94r}{53}, \frac{12r}{53}, r\right)$$

39.

$$\begin{aligned} 2x + 3y + 5z + 5w &= 0 \\ &7y + 2z + 9w = 0 \\ 3x + 5y + z + 5w &= 0 \end{aligned}$$

$$\text{Solución } \left(\frac{38r}{93}, -\frac{107r}{93}, -\frac{44r}{93}, r\right)$$

40.

$$\begin{aligned} 4x + 6y + 5z + 5w &= 0 \\ x + 8y + 8z + 5w &= 0 \\ 2x + 7y - z + 2w &= 0 \end{aligned}$$

$$\text{Solución } \left(-\frac{99r}{199}, -\frac{39r}{199}, -\frac{73r}{199}, r\right)$$

41.

$$\begin{aligned} 8x + y + 5z - w &= 0 \\ x + y + 6z - w &= 0 \\ 4x + 6y + 5z + 9w &= 0 \end{aligned}$$

$$\text{Solución } \left(\frac{5r}{73}, -\frac{142r}{73}, \frac{35r}{73}, r\right)$$

42.

$$\begin{aligned} -x + 6y - z + 2w &= 0 \\ 2x - y + 2z + 9w &= 0 \\ 9x + 8y + 4z + 7w &= 0 \end{aligned}$$

$$\text{Solución } \left(\frac{251r}{55}, -\frac{13r}{11}, -\frac{531r}{55}, r \right)$$

43.

$$3x + 8y + 3z + 2w = 0$$

$$4x + 8y + 7z + 7w = 0$$

$$4x + 9y + 4z + 9w = 0$$

$$\text{Solución } \left(-\frac{191r}{15}, \frac{19r}{5}, \frac{29r}{15}, r \right)$$

44.

$$9x + 9y + 2z + 3w = 0$$

$$2x + 4y + 4z + 3w = 0$$

$$2x + 4y + 9z + 7w = 0$$

$$\text{Solución } \left(-\frac{37r}{90}, \frac{23r}{90}, -\frac{4r}{5}, r \right)$$

45.

$$8x + 2y + 5z + 2w = 0$$

$$8x + y + 9z + 4w = 0$$

$$x + y - z + 9w = 0$$

$$\text{Solución } \left(\frac{125r}{11}, -\frac{306r}{11}, -\frac{82r}{11}, r \right)$$

46.

$$-x - y + 2z + 5w = 0$$

$$4x + 5y - z + 6w = 0$$

$$2x + 5y + 7z + 4w = 0$$

$$\text{Solución } \left(-\frac{133r}{5}, \frac{94r}{5}, -\frac{32r}{5}, r \right)$$

47.

$$-x + 2y - z - w = 0$$

$$-y - z + 2w = 0$$

Solución $(3r - 3s, 2r - s, s, r)$

48.

$$\begin{aligned}x + 2y - z &= 0 \\2x - y + z - w &= 0\end{aligned}$$

Solución $(\frac{2r}{5} - \frac{s}{5}, -\frac{r}{5} + \frac{3s}{5}, s, r)$

49.

$$\begin{aligned}-x + 2y - z - w &= 0 \\-y - z + 2w &= 0\end{aligned}$$

Solución $(3r - 3s, 2r - s, s, r)$

50.

$$\begin{aligned}x - y + z + 2w &= 0 \\2x - y - z - w &= 0\end{aligned}$$

Solución $(3r + 2s, 5r + 3s, s, r)$

51.

$$\begin{aligned}x - y - z + 2w &= 0 \\x + y + z + w &= 0\end{aligned}$$

Solución $(-\frac{3w}{2}, \frac{r}{2} - s, s, r)$

52.

$$\begin{aligned}2x + 2y - z + 2w &= 0 \\2x - y + 2z + 2w &= 0\end{aligned}$$

Solución $(-r - \frac{s}{2}, s, s, r)$

53.

$$\begin{aligned}3x + 2y - z - w &= 0 \\3x + 3y + 3z - w &= 0\end{aligned}$$

Solución $(\frac{r}{3} + 3s, -4s, s, r)$

54.

$$\begin{aligned} -x + y + 2z - w &= 0 \\ -x + 2y - z - w &= 0 \end{aligned}$$

Solución $(-r + 5s, 3s, s, r)$

55.

$$\begin{aligned} 2x + 2y + 2z + w &= 0 \\ 3x + 2y + z + 3w &= 0 \end{aligned}$$

Solución $(-2r + s, \frac{3r}{2} - 2s, s, r)$

56.

$$\begin{aligned} x - y + 2z + w &= 0 \\ 2x - y - z - w &= 0 \end{aligned}$$

Solución $(2r + 3s, 3r + 5s, s, r)$

57.

$$\begin{aligned} 2x + 2y + 2z + 8w &= 0 \\ -x + 6y + 6z + 3w &= 0 \\ x + 2y + 2z + 5w &= 0 \end{aligned}$$

Solución $(-3r, -r - s, s, r)$

58.

$$\begin{aligned} 2x + 2y + 2z + 2w &= 0 \\ -x + 5y - z - w &= 0 \\ 8x + 2y + 8z + 8w &= 0 \end{aligned}$$

Solución $(-r - s, 0, s, r)$

59.

$$8x + 2y + 4z + 8w = 0$$

$$4x - y + 2z + 4w = 0$$

$$2x + 2y + z + 2w = 0$$

Solución $(-r - \frac{s}{2}, 0, s, r)$

60.

$$9x + 3y + 3z + w = 0$$

$$7x + 3y + 5z + 3w = 0$$

$$6x + 3y + 6z + 4w = 0$$

Solución $(r + s, -\frac{10r}{3}, s, r)$

61.

$$9x + 3y + 3z + w = 0$$

$$7x + 3y + 5z + 3w = 0$$

$$6x + 3y + 6z + 4w = 0$$

Solución $(5r - s, s, -\frac{9r}{2}, r)$

62.

$$5x + 5y + 2z + 2w = 0$$

$$5x + 2y + 2z - w = 0$$

$$5x + 6y + 2z + 3w = 0$$

Solución $(\frac{3r}{5} - \frac{2s}{5}, -r, s, r)$

63.

$$3x + 3y + 2z + 2w = 0$$

$$4x + 3y + 3z + 7w = 0$$

$$5x + 6y + 3z - w = 0$$

$$\text{Solución } \left(-5r - s, \frac{13r}{3} + \frac{s}{3}, s, r\right)$$

64.

$$2x + 8y + 6z + 4w = 0$$

$$x + 8y + 4z + w = 0$$

$$2x + 4y + 5z + 5w = 0$$

$$\text{Solución } \left(-3r - 2s, \frac{r}{4} - \frac{s}{4}, s, r\right)$$

65.

$$3x + 2y + 2z + 9w = 0$$

$$2x + 2y + 2z + 5w = 0$$

$$2x + 4y + 4z + 2w = 0$$

$$\text{Solución } \left(-4r, \frac{3r}{2} - s, s, r\right)$$

66.

$$3x + 2y + 2z + 9w = 0$$

$$2x + 2y + 2z + 5w = 0$$

$$2x + 4y + 4z + 2w = 0$$

$$\text{Solución } \left(-4r, \frac{3r}{2} - s, s, r\right)$$

67.

$$9x + 3y + 9z + 3w = 0$$

$$6x - y + 9z + 2w = 0$$

$$6x + 2y + 6z + 2w = 0$$

$$\text{Solución } \left(-\frac{r}{3} - \frac{4s}{3}, s, s, r\right)$$

68.

$$\begin{aligned}9x + 3y - z + 3w &= 0 \\ -x + 3y + 3z + 5w &= 0 \\ 8x + 6y + 2z + 8w &= 0\end{aligned}$$

$$\text{Solución } \left(\frac{r}{5} + \frac{2s}{5}, -\frac{8r}{5} - \frac{13s}{5}, s, r \right)$$

69.

$$\begin{aligned}2x + 7y + 2z + 8w &= 0 \\ 4x + 8y + 4z + 8w &= 0 \\ 3x + 3y + 3z + 2w &= 0\end{aligned}$$

$$\text{Solución } \left(\frac{2r}{3} - s, -\frac{4r}{3}, s, r \right)$$

70.

$$\begin{aligned}9x + 8y + 2z - w &= 0 \\ 4x + 2y + 4z + 5w &= 0 \\ 5x + 4y + 2z + w &= 0\end{aligned}$$

$$\text{Solución } \left(-3r - 2s, \frac{7r}{2} + 2s, s, r \right)$$

71.

$$\begin{aligned}x + 4y + z + w &= 0 \\ 2x + 8y + 2z + 2w &= 0 \\ 2x + 8y + 9z + 5w &= 0\end{aligned}$$

$$\text{Solución } \left(-\frac{4r}{7} - 4s, s, -\frac{3r}{7}, r \right)$$

72.

$$\begin{aligned}8x + 4y + 6z + 2w &= 0 \\ 6x + 8y + 4z + 4w &= 0 \\ 3x + 4y + 2z + 2w &= 0\end{aligned}$$

$$\text{Solución } \left(-\frac{4s}{5}, -\frac{r}{2} + \frac{s}{10}, s, r\right)$$

73.

$$4x + 4y + 9z + 9w = 0$$

$$5x + 6y + 5z + 9w = 0$$

$$6x + 8y + z + 9w = 0$$

$$\text{Solución } \left(-\frac{9r}{2} - \frac{17s}{2}, \frac{9r}{4} + \frac{25s}{4}, s, r\right)$$

74.

$$5x + 3y + 2z + 5w = 0$$

$$2x + 4y - z + 4w = 0$$

$$8x + 2y + 5z + 6w = 0$$

$$\text{Solución } \left(-\frac{4r}{7} - \frac{11s}{14}, -\frac{5r}{7} + \frac{9s}{14}, s, r\right)$$

75.

$$5x + 5y - z + 7w = 0$$

$$9x - y - z + 5w = 0$$

$$3x + 8y - z + 8w = 0$$

$$\text{Solución } \left(-\frac{16r}{25} + \frac{3s}{25}, -\frac{19r}{25} + \frac{2s}{25}, s, r\right)$$

76.

$$3x + y + z + 2w = 0$$

$$2x + 6y + 2z + 6w = 0$$

$$6x + 2y + 2z + 4w = 0$$

$$\text{Solución } \left(-\frac{3r}{8} - \frac{s}{4}, -\frac{7r}{8} - \frac{s}{4}, s, r\right)$$

77.

$$2x + 6y - z + 4w = 0$$

$$5x + 9y + 5z + 3w = 0$$

$$3x + 3y + 6z - w = 0$$

$$\text{Solución } \left(\frac{3r}{2} - \frac{13s}{4}, -\frac{7r}{6} + \frac{5s}{4}, s, r \right)$$

78.

$$7x + 8y - z + 6w = 0$$

$$6x + 9y + 9z + 9w = 0$$

$$2x + 3y + 3z + 3w = 0$$

$$\text{Solución } \left(\frac{6r}{5} + \frac{27s}{5}, -\frac{9r}{5} - \frac{23s}{5}, s, r \right)$$

79.

$$4x + 8y - z + 6w = 0$$

$$2x + 7y + z + 2w = 0$$

$$2x + 9y + 2z + w = 0$$

$$\text{Solución } \left(-\frac{11r}{4} + \frac{5s}{4}, \frac{r}{2} - \frac{s}{2}, s, r \right)$$

80.

$$4x + 8y - z + 6w = 0$$

$$2x + 7y + z + 2w = 0$$

$$2x + 9y + 2z + w = 0$$

$$\text{Solución } \left(-\frac{11r}{4} + \frac{5s}{4}, \frac{r}{2} - \frac{s}{2}, s, r \right)$$

81.

$$2x + 9y + z + 9w = 0$$

$$2x + 3y + 9z + 5w = 0$$

$$2x + 9y + z + 9w = 0$$

$$\text{Solución } \left(-\frac{3r}{2} - \frac{13s}{2}, -\frac{2r}{3} + \frac{4s}{3}, s, r\right)$$

82.

$$\begin{aligned}4x + 6y + 2z + 2w &= 0 \\8x + y - z + 5w &= 0 \\-x + 4y + 2z - w &= 0\end{aligned}$$

$$\text{Solución } \left(-\frac{7r}{11} + \frac{2s}{11}, \frac{r}{11} - \frac{5s}{11}, s, r\right)$$

83.

$$\begin{aligned}9x + 9y + 8z + w &= 0 \\8x + 7y + z + 2w &= 0 \\x + 2y + 7z - w &= 0\end{aligned}$$

$$\text{Solución } \left(-\frac{11r}{9} + \frac{47s}{9}, \frac{10r}{9} - \frac{55s}{9}, s, r\right)$$

84.

$$\begin{aligned}-x + 2y + 2z + 2w + 3v &= 0 \\-x + y - z - w + v &= 0\end{aligned}$$

$$\text{Solución } (-r - 4s - 4t, -2r - 3s - 3t, t, s, r)$$

85.

$$\begin{aligned}2x + 3y - z - w + 2v &= 0 \\x + y - z + w - v &= 0\end{aligned}$$

$$\text{Solución } (5r - 4s + 2t, -4r + 3s - t, t, s, r)$$

86.

$$\begin{aligned}2x + 3y + 3z + 3w + 2v &= 0 \\x + 2y + 2z + 3w - v &= 0\end{aligned}$$

$$\text{Solución } (-7r + 3s, 4r - 3s - t, t, s, r)$$

87.

$$\begin{aligned} -x - y + 3z + 2w + 2v &= 0 \\ x + 3y + z + 2w + 2v &= 0 \end{aligned}$$

Solución $(4r + 4s + 5t, -2r - 2s - 2t, t, s, r)$

88.

$$\begin{aligned} 3x + 2y + 2z + w + 3v &= 0 \\ x - y - z + 3w + 2v &= 0 \end{aligned}$$

Solución $(-\frac{7r}{5} - \frac{7s}{5}, \frac{3r}{5} + \frac{8s}{5} - t, t, s, r)$

89.

$$\begin{aligned} 2x + 3y - z + 3w - v &= 0 \\ 2x + y + 3z + 3w + v &= 0 \end{aligned}$$

Solución $(-r - \frac{3s}{2} - \frac{5t}{2}, r + 2t, t, s, r)$

90.

$$\begin{aligned} 3x + y - z + w - v &= 0 \\ x + y - z + 2w + 2v &= 0 \end{aligned}$$

Solución $(\frac{3r}{2} + \frac{s}{2}, -\frac{7r}{2} - \frac{5s}{2} + t, t, s, r)$

91.

$$\begin{aligned} -x + 2y + 2z + 2w + 2v &= 0 \\ 2x + 3y + 3z + 3w + 3v &= 0 \\ x + y + z + w + v &= 0 \end{aligned}$$

Solución $(0, -r - s - t, t, s, r)$

92.

$$\begin{aligned} x - y + 3z + 3w + 3v &= 0 \\ -x - 2z - w - 2v &= 0 \\ x + y + z - w + v &= 0 \end{aligned}$$

Solución $(-2r - s - 2t, r + 2s + t, t, s, r)$

93.

$$\begin{aligned} -2x + 3y - z + w + 3v &= 0 \\ -x + y + 2z + 2w + v &= 0 \\ x - 2y + 3z + w - 2v &= 0 \end{aligned}$$

Solución $(5s + 7t, -r + 3s + 5t, t, s, r)$

94.

$$\begin{aligned} 3x + 2y + 2z + 2w - 2v &= 0 \\ 2x + 3y + 3z + 3w + 2v &= 0 \\ -2x - 2y - 2z - 2w &= 0 \end{aligned}$$

Solución $(2r, -2r - s - t, t, s, r)$

95.

$$\begin{aligned} 3x - 2y - 2z + w + v &= 0 \\ 3x - 2z - w + 3v &= 0 \\ -2y + 2w - 2v &= 0 \end{aligned}$$

Solución $(-r + \frac{s}{3} + \frac{2t}{3}, -r + s, t, s, r)$

96.

$$\begin{aligned} -2x + 2y + 2z - 2w + 2v &= 0 \\ -x + y + z - w + v &= 0 \\ -x + 3y - 2z - 2w + v &= 0 \end{aligned}$$

Solución $(r - \frac{s}{2} + \frac{5t}{2}, \frac{s}{2} + \frac{3t}{2}, t, s, r)$

97.

$$\begin{aligned} -2x - 2z - w + v &= 0 \\ 3x - 2y + z + 2w + v &= 0 \\ x - 2y - z + w + 2v &= 0 \end{aligned}$$

$$\text{Solución } \left(\frac{r}{2} - \frac{s}{2} - t, \frac{5r}{4} + \frac{s}{4} - t, t, s, r \right)$$

98.

$$\begin{aligned} -x - y + w - v &= 0 \\ -2x + y - 2z + w + v &= 0 \\ -2x - 2y + 2w - 2v &= 0 \end{aligned}$$

$$\text{Solución } \left(\frac{2s}{3} - \frac{2t}{3}, -r + \frac{s}{3} + \frac{2t}{3}, t, s, r \right)$$

99.

$$\begin{aligned} -x + 2y - z + 2w - 2v &= 0 \\ 3x + 3z - w + 3v &= 0 \\ -2x - 2y - 2z - w - v &= 0 \end{aligned}$$

$$\text{Solución } \left(-r + \frac{s}{3} - t, \frac{r}{2} - \frac{5s}{6}, t, s, r \right)$$

100.

$$\begin{aligned} 5x + 6y + 5z + 2w + 3v &= 0 \\ 6x + 8y + 6z + 5w + 2v &= 0 \\ x + 2y + z + 3w - v &= 0 \end{aligned}$$

$$\text{Solución } \left(-3r + \frac{7s}{3} - t, 2r - \frac{13s}{4}, t, s, r \right)$$