MathCon

The Mathematics Firm

Sistemas de Ecuaciones Lineales Homogéneos

100 Problemas de Sistemas de Ecuaciones Lineales Homogéneos

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Contenido

1

Sistemas de Ecuaciones Lineales Homogéneos

Resolver los siguientes sistemas de ecuaciones lineales homogéneos.

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.
$$\begin{aligned} 2x &- y - z = 0 \\ x &- y + 2z = 0 \\ 2x &- y - z = 0 \end{aligned}$$
Solución $(3r, 5r, r)$

5.
$$\begin{aligned} 2x &+ y + z = 0 \\ x &- y + 2z = 0 \\ 2x &+ y + z = 0 \end{aligned}$$
Solución $(-r, r, r)$

6.
$$\begin{aligned} -x &+ y - z = 0 \\ -x &+ y - z = 0 \\ 2x &+ 2y - z = 0 \end{aligned}$$
Solución $(-\frac{r}{4}, \frac{3r}{4}, r)$

7.
$$\begin{aligned} 2x &+ 2y - z = 0 \\ 2x &+ 2y - z = 0 \\ x &+ 2y + z = 0 \end{aligned}$$
Solución $(2r, -\frac{3r}{2}, r)$

8.
$$\begin{aligned} 2x &+ 2y - z = 0 \\ -x &+ 2y + z = 0 \\ -x &+ 2y + z = 0 \end{aligned}$$
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.
$$\begin{aligned} -2x &- 2y + 9z = 0 \\ 4x & \quad + 9z = 0 \\ -2x &- 2y + 9z = 0 \end{aligned}$$
Solución $(-\frac{9r}{4}, \frac{27r}{4}, r)$

15.
$$\begin{aligned} x + y + 2z &= 0 \\ x + 2y - z &= 0 \\ x + y + 2z &= 0 \end{aligned}$$
Solución $(-5r, 3r, r)$

16.
$$\begin{aligned} 4y + 6z &= 0 \\ 9x + 2y - z &= 0 \\ 9x + 4y + 2z &= 0 \end{aligned}$$
Solución $(\frac{4r}{9}, -\frac{3r}{2}, r)$

17.
$$\begin{aligned} 2x - 10y + 6z &= 0 \\ x - 5y + 3z &= 0 \\ -4x - 6y + 2z &= 0 \end{aligned}$$
Solución $(-\frac{4r}{13}, \frac{7r}{13}, r)$

18.
$$\begin{aligned} -2x - 6y + 9z &= 0 \\ -8x + 3y - 9z &= 0 \\ -4x \quad - 2z &= 0 \end{aligned}$$
Solución $(-\frac{r}{2}, \frac{5r}{3}, r)$

19.
$$\begin{aligned} 4x &\quad &+ z &= 0 \\ -5x &- 3y &+ 5z &= 0 \\ -x &- 3y &+ 6z &= 0 \end{aligned}$$
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.
$$\begin{aligned} -3x &+ 9y &- 3z &= 0 \\ 7x &+ 2y &+ 9z &= 0 \\ 6x &+ 5y &+ 8z &= 0 \end{aligned}$$

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

24.
$$\begin{aligned} 7x &+ 4y - 3z = 0 \\ 6x &+ 2y - 3z = 0 \\ -x &+ 8y + 3z = 0 \end{aligned}$$

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

25.
$$\begin{aligned} 6x &- 2y + 3z = 0 \\ 6x &- 2y + 3z = 0 \\ 7x &- 5y - 4z = 0 \end{aligned}$$

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

26.
$$\begin{aligned} -5x &+ 5y - 2z = 0 \\ 8x &+ 7y + 3z = 0 \\ 8x &+ 7y + 3z = 0 \end{aligned}$$

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

27.
$$\begin{aligned} -4x &+ 2y + 3z = 0 \\ 4x &- 2y - 3z = 0 \\ 6x &+ 3y + 7z = 0 \end{aligned}$$

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

28.
$$\begin{aligned} x &- 3y - 3z = 0 \\ 8x &+ 7y + 2z = 0 \\ -x &+ 3y + 3z = 0 \end{aligned}$$
Solución $(\frac{15r}{31}, -\frac{26r}{31}, r)$

29.
$$\begin{aligned} -5x &+ 3y + 8z = 0 \\ 4x &+ 4y + z = 0 \\ -x &+ 7y + 9z = 0 \end{aligned}$$
Solución $(\frac{29r}{32}, -\frac{37r}{32}, r)$

30.
$$\begin{aligned} -x &+ y + 2z + w = 0 \\ x &+ y - z + w = 0 \\ 2x &+ y - z + w = 0 \end{aligned}$$
Solución $(-r, -r, -r, r)$

31.
$$\begin{aligned} x &+ y + 2z + w = 0 \\ -x &- y - z + w = 0 \\ -x &+ 2y + z + 2w = 0 \end{aligned}$$
Solución $(2r, r, -2r, r)$

32.
$$\begin{aligned} -x &+ y + 2z - w = 0 \\ x &- y + 2z - w = 0 \\ -x &- y - z + 2w = 0 \end{aligned}$$
Solución $(\frac{3r}{4}, \frac{3r}{4}, \frac{r}{2}, r)$

33.
$$\begin{aligned} -x &+ 2y + z - w = 0 \\ -x &+ 2y + z - w = 0 \\ x &- y - z + 2w = 0 \end{aligned}$$
Solución $(-3r+s, -r, s, r)$

34.
$$\begin{aligned} -x &+ 7y + 9z + 3w = 0 \\ 2x & \quad + 6z + 2w = 0 \\ x &+ 5y + 7z + 2w = 0 \end{aligned}$$
Solución $(\frac{7r}{32}, \frac{r}{8}, -\frac{13r}{32}, r)$

35.
$$\begin{aligned} 2x &+ 7y + 9z + 6w = 0 \\ 8x & \quad + 2z + 6w = 0 \\ x &+ 5y + 7z + w = 0 \end{aligned}$$
Solución $(-\frac{35r}{19}, -\frac{113r}{19}, \frac{83r}{19}, r)$

36.
$$\begin{aligned} x &+ 7y - z + 2w = 0 \\ 8x &+ 4y + 4z + 5w = 0 \\ 2x &+ 6y + z + w = 0 \end{aligned}$$
Solución $(-\frac{73r}{60}, \frac{r}{20}, \frac{17r}{15}, r)$

37.
$$\begin{aligned} 6x &- y + 4z + 8w = 0 \\ 7x &+ 3y \quad + 3w = 0 \\ 6x &+ 3y + 8z = 0 \end{aligned}$$
Solución $(-\frac{63r}{53}, \frac{94r}{53}, \frac{12r}{53}, r)$

38.

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

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

39.

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

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

40.

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

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

41.

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

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

42.

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

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

43.

$$\begin{aligned} 3x &+ 8y + 3z + 2w = 0 \\ 4x &+ 8y + 7z + 7w = 0 \\ 4x &+ 9y + 4z + 9w = 0 \end{aligned}$$

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

44.

$$\begin{aligned} 9x &+ 9y + 2z + 3w = 0 \\ 2x &+ 4y + 4z + 3w = 0 \\ 2x &+ 4y + 9z + 7w = 0 \end{aligned}$$

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

45.

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

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

46.

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

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

47.

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

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.

$$\begin{array}{rcrcrcrcl} 8x & + & 2y & + & 4z & + & 8w & = & 0 \\ 4x & - & y & + & 2z & + & 4w & = & 0 \\ 2x & + & 2y & + & z & + & 2w & = & 0 \end{array}$$

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

60.

$$\begin{array}{rcrcrcrcl} 9x & + & 3y & + & 3z & + & w & = & 0 \\ 7x & + & 3y & + & 5z & + & 3w & = & 0 \\ 6x & + & 3y & + & 6z & + & 4w & = & 0 \end{array}$$

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

61.

$$\begin{array}{rcrcrcrcl} 9x & + & 3y & + & 3z & + & w & = & 0 \\ 7x & + & 3y & + & 5z & + & 3w & = & 0 \\ 6x & + & 3y & + & 6z & + & 4w & = & 0 \end{array}$$

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

62.

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

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

63.

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

Solución $(-5r - s, \dfrac{13r}{3} + \dfrac{s}{3}, s, r)$

64.

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

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

65.

$$\begin{aligned} 3x &+ 2y + 2z + 9w = 0 \\ 2x &+ 2y + 2z + 5w = 0 \\ 2x &+ 4y + 4z + 2w = 0 \end{aligned}$$

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

66.

$$\begin{aligned} 3x &+ 2y + 2z + 9w = 0 \\ 2x &+ 2y + 2z + 5w = 0 \\ 2x &+ 4y + 4z + 2w = 0 \end{aligned}$$

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

67.

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

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

68.

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

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

69.

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

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

70.

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

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

71.

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

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

72.

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

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

73.

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

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

74.

$$\begin{aligned} 5x &+ 3y &+ 2z &+ 5w &= 0 \\ 2x &+ 4y &- z &+ 4w &= 0 \\ 8x &+ 2y &+ 5z &+ 6w &= 0 \end{aligned}$$

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

75.

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

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

76.

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

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

77.

$$\begin{array}{rcrcrcrcl} 2x & + & 6y & - & z & + & 4w & = & 0 \\ 5x & + & 9y & + & 5z & + & 3w & = & 0 \\ 3x & + & 3y & + & 6z & - & w & = & 0 \end{array}$$

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

78.

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

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

79.

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

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

80.

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

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

81.

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

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

82.
$$\begin{aligned} 4x &+ 6y + 2z + 2w = 0 \\ 8x &+ y - z + 5w = 0 \\ -x &+ 4y + 2z - w = 0 \end{aligned}$$

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

83.
$$\begin{aligned} 9x &+ 9y + 8z + w = 0 \\ 8x &+ 7y + z + 2w = 0 \\ x &+ 2y + 7z - w = 0 \end{aligned}$$

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

84.
$$\begin{aligned} -x &+ 2y + 2z + 2w + 3v = 0 \\ -x &+ y - z - w + v = 0 \end{aligned}$$

Solución $(-r - 4s - 4t, -2r - 3s - 3t, t, s, r)$

85.
$$\begin{aligned} 2x &+ 3y - z - w + 2v = 0 \\ x &+ y - z + w - v = 0 \end{aligned}$$

Solución $(5r - 4s + 2t, -4r + 3s - t, t, s, r)$

86.
$$\begin{aligned} 2x &+ 3y + 3z + 3w + 2v = 0 \\ x &+ 2y + 2z + 3w - v = 0 \end{aligned}$$

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

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

94.
$$\begin{array}{rcrcrcrcrcr} 3x & + & 2y & + & 2z & + & 2w & - & 2v & = & 0 \\ 2x & + & 3y & + & 3z & + & 3w & + & 2v & = & 0 \\ -2x & - & 2y & - & 2z & - & 2w & & & = & 0 \end{array}$$

Solución $(2r, -2r - s - t, t, s, r)$

95.
$$\begin{array}{rcrcrcrcrcr} 3x & - & 2y & - & 2z & + & w & + & v & = & 0 \\ 3x & & & - & 2z & - & w & + & 3v & = & 0 \\ & - & 2y & & & + & 2w & - & 2v & = & 0 \end{array}$$

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

96.
$$\begin{array}{rcrcrcrcrcr} -2x & + & 2y & + & 2z & - & 2w & + & 2v & = & 0 \\ -x & + & y & + & z & - & w & + & v & = & 0 \\ -x & + & 3y & - & 2z & - & 2w & + & v & = & 0 \end{array}$$

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

97.
$$\begin{array}{rcrcrcrcrcr} -2x & & & - & 2z & - & w & + & v & = & 0 \\ 3x & - & 2y & + & z & + & 2w & + & v & = & 0 \\ x & - & 2y & - & z & + & w & + & 2v & = & 0 \end{array}$$

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

98.

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

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

99.

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

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

100.

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

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