

Matrix Equations - Problems

2x2 matrices

Solve the following systems of equations:

$$\begin{aligned} 2x + 4y &= 14 \\ 3x + y &= -4 \end{aligned} \quad \text{Answers: } x = -3, y = 5.$$

$$\begin{aligned} 5x - 4y &= 6 \\ 3x + 4y &= 10 \end{aligned} \quad \text{Answers: } x = 2, y = 1.$$

$$\begin{aligned} 2x + 3y &= 15 \\ x - 3y &= -6 \end{aligned} \quad \text{Answers: } x = 3, y = 3.$$

$$\begin{aligned} 7x + 2y &= -1 \\ 3x + y &= -1 \end{aligned} \quad \text{Answers: } x = 1, y = -4.$$

3x3 matrices

$$\begin{aligned} x + 2y + 3z &= 9 \\ -2x + y + z &= -2 \\ 3x - 2y - z &= 5 \end{aligned} \quad \text{Answers: } x = 2, y = -1, z = 3.$$

$$\begin{aligned} 4x - y - z &= 9 \\ x - 2y - 3z &= -4 \\ -2x + 4y + 3z &= 5 \end{aligned} \quad \text{Answers: } x = 3, y = 2, z = 1.$$

$$\begin{aligned} 3x + 2y + 6z &= 1 \\ 2x - 2y + 3z &= 4 \\ x + y + z &= 0 \end{aligned} \quad \text{Answers: } x = 1, y = -1, z = 0.$$

4x4 matrices

$$\begin{aligned}2x + y + 3z + 4w &= 7 \\3x - 2y - z - w &= 17 \\-x + 2y + 2z + 2w &= -8 \\x + 4y + z - w &= -5\end{aligned}$$

Answers: $x = 4$, $y = -3$, $z = 2$, $w = -1$.

$$\begin{aligned}-x + y + z + w &= 8 \\2x + y - 2z + w &= 2 \\3x + y + 3z + 2w &= 22 \\4x - y - 2z - 2w &= -12\end{aligned}$$

Answers: $x = 1$, $y = 2$, $z = 3$, $w = 4$.

$$\begin{aligned}4x + 3y - z - 2w &= -28 \\2x - 2y + 3z + w &= 16 \\-3x - y - 2z - w &= 4 \\x + y + z + w &= -3\end{aligned}$$

Answers: $x = -2$, $y = -5$, $z = 3$, $w = 1$.

3x4 matrices

These are not as easy since you don't have enough equations to solve for all the variables. So usually we set one variable equal to t , and then express the others in terms of t .

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

Answers: $x = 29 + 9t$, $y = -4 - 2t$, $z = 15 + 4t$, $w = t$.

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

Answers: $x = 1 - 3t$, $y = 2 - 2t$, $z = 3 - 2t$, $w = t$.

$$\begin{aligned}x - y - w &= 1 \\2x - y + z + w &= 4 \\-3x + 4y + 2z + 7w &= 0\end{aligned}$$

Answers: $x = 2 - t$, $y = 1 - 2t$, $z = 1 - t$, $w = t$.