

# Gaussian Elimination

abc2142

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## 1 Introduction

We are given a system of linear equations

$$-7x + y = 2 \quad (1)$$

$$3x - 3y = 3 \quad (2)$$

Next, we multiply the first equation by  $3/7$  to obtain  $-3x + \frac{3}{7}y = \frac{6}{7}$ , and add it to the second equation.

$$-7x + y = 2 \quad (3)$$

$$3x - 3y + (-3x + \frac{3}{7}y) = 3 + \frac{6}{7} \rightarrow -\frac{18}{7}y = 3 + \frac{6}{7} \quad (4)$$

Then, we can solve for  $y$  from the second equation.

$$-7x + y = 2 \quad (5)$$

$$y = -\frac{3}{2} \quad (6)$$

Now, subtract the second equation from the first equation

$$-7x = 2 + \frac{3}{2} = \frac{7}{2} \rightarrow x = -\frac{1}{2} \quad (7)$$

$$y = -\frac{3}{2} \quad (8)$$

### 1.1 Gaussian Elimination

$$\begin{bmatrix} -7 & 1 & 2 \\ 3 & -3 & 3 \end{bmatrix} \rightarrow \begin{bmatrix} -7 & 1 & 2 \\ 0 & 1 & -\frac{3}{2} \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 0 & -\frac{1}{2} \\ 0 & 1 & -\frac{3}{2} \end{bmatrix} \quad (9)$$