# Solving a system of equations

$$1\,x_1 + 3\,x_2 + 6\,x_3 = 3$$
$$2\,x_1 + 4\,x_2 + 7\,x_3 = 2$$
$$3\,x_1 + 5\,x_2 + 8\,x_3 = 3$$

# Solving a system of equations

$$
\begin{array}{lll}
1\,x_1 + 3\,x_2 + 6\,x_3 = 3 & & 1 \\
2\,x_1 + 4\,x_2 + 7\,x_3 = 2 & & -2 \\
3\,x_1 + 5\,x_2 + 8\,x_3 = 3 & & 1 \\
\hline
0 = 2 & &
\end{array}
$$

no solution

# Solving a system of equations

$$a_{11}\,x_1 + a_{12}\,x_2 + a_{13}\,x_3 = b_1$$
$$a_{21}\,x_1 + a_{22}\,x_2 + a_{23}\,x_3 = b_2$$
$$a_{31}\,x_1 + a_{32}\,x_2 + a_{33}\,x_3 = b_3$$

$A\,x = b$ has a solution iff

$$\text{rank}\,(A) = \text{rank}\,(A\ b)$$