**Signature**

Carl Friedrich Gauss (1777–1855), painted by Christian Albrecht Jensen

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|---|---|
| **Born** | 30 April 1777 Braunschweig, Electorate of Brunswick-Lüneburg, Holy Roman Empire |
| **Died** | 23 February 1855 (aged 77) Göttingen, Kingdom of Hanover |
| **Residence** | Kingdom of Hanover |
| **Nationality** | German |
| **Fields** | Mathematics and Physics |
| **Institutions** | University of Göttingen |
| **Alma mater** | University of Helmstedt |

# Early years (1777–1798)

Statue of Gauss at his birthplace, Braunschweig

Carl Friedrich Gauss was born on April 30, 1777 in Braunschweig, in the duchy of Braunschweig-Wolfenbüttel, now part of Lower Saxony, Germany, as the son of poor working-class parents.[4] Indeed, his mother was illiterate and never recorded the date of his birth, remembering only that he had been born on a Wednesday, eight days before the Feast of the Ascension, which itself occurs 40 days after Easter. Gauss would later solve this puzzle for his birthdate in the context of finding the date of Easter, deriving methods to compute the date in both past and future years.[5] He was christened and confirmed in a church near the school he attended as a child.[6]

- 高斯


A 10 Deutsche Mark banknote from Germany 1993 (discontinued) showing Gauss


Gauss (about 26) on an East -German stamp produced in 1977. Heptadecagon, compass and straightedge are shown next to him.

# Least Square Method

- Least Square Method

# 大地測量與線性系統

- Linear System

- 物理研究
- 電話電報系統
- 地球磁場圖
  - 磁南極
  - 磁北極

- Carl Friedrich Gauss - Wikipedia, the free encyclopedia

# Matrix

- 維基百科
  [Wiki Matrix]

# Matrix

- Matrix (mathematics) - Wikipedia, the free encyclopedia

# Matrix

$$\begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix}$$

{{1,-1},{2,-1}}

# Column

$$\begin{pmatrix} 1 \\ 2 \end{pmatrix}$$

{{1},{2}}

# Multiplication

$$\begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix} \begin{pmatrix} 1 \\ 2 \end{pmatrix} = \begin{pmatrix} ? \\ ? \end{pmatrix}$$

{{1,-1},{2,-1}}.{{1},{2}}

# Linear System

$$\begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -1 \\ 0 \end{pmatrix}$$

# Transpose

$$\mathbf{a} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}, \mathbf{a}^T = \begin{pmatrix} 1 & 2 \end{pmatrix}$$

transpose{{1},{2}}

# Inner Product

$$\mathbf{a} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}, \mathbf{a}^T = \begin{pmatrix} 1 & 2 \end{pmatrix}$$

$$\mathbf{a}^T \mathbf{a} = ?$$

# Outer Product

$$\mathbf{a} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}, \mathbf{a}^T = \begin{pmatrix} 1 & 2 \end{pmatrix}$$

$$\mathbf{a}\mathbf{a}^T = ?$$

# Inversion

$$A = \begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix}$$

$$A^{-1} = ?$$

inv{{1,-1},{2,-1}}

# Linear System

$$\begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -1 \\ 0 \end{pmatrix}$$

$$\mathrm{A} = \begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix}, \begin{pmatrix} x \\ y \end{pmatrix} = A^{-1}\begin{pmatrix} -1 \\ 0 \end{pmatrix}$$

# Linear System

$$\begin{pmatrix} 1 & -1 & 2 \\ 2 & -1 & 1 \\ 1 & 2 & 3 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} -3 \\ -1 \\ 2 \end{pmatrix}$$

# EX1: Multiplication

$$\begin{pmatrix} 1 & -1 & 2 \\ 2 & -1 & 1 \\ 1 & 2 & 3 \end{pmatrix} \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix} = \begin{pmatrix} ? \\ ? \\ ? \end{pmatrix}$$

# Ex2: Transpose

$$\mathbf{a} = \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix}, \mathbf{a}^T = \begin{pmatrix} 1 & 2 & -1 \end{pmatrix}$$

# Ex3: Inner Product

$$\mathbf{a} = \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix}, \mathbf{a}^T = \begin{pmatrix} 1 & 2 & -1 \end{pmatrix}$$

$$\mathbf{a}^T \mathbf{a} = ?$$

# Ex4: Outer Product

$$\mathbf{a} = \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix}, \mathbf{a}^T = \begin{pmatrix} 1 & 2 & -1 \end{pmatrix}$$

$$\mathbf{a}\mathbf{a}^T = ?$$

# Ex5: Inversion

$$A = \begin{pmatrix} 1 & -1 & 2 \\ 2 & -1 & 1 \\ 1 & 2 & 3 \end{pmatrix}$$

$$A^{-1} = ?$$

# Ex6: Linear System

$$\begin{pmatrix} 1 & -1 & 2 \\ 2 & -1 & 1 \\ 1 & 2 & 3 \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} -3 \\ -1 \\ 2 \end{pmatrix}$$

$$A = \begin{pmatrix} 1 & -1 & 2 \\ 2 & -1 & 1 \\ 1 & 2 & 3 \end{pmatrix},$$

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = A^{-1}\begin{pmatrix} -3 \\ -1 \\ 2 \end{pmatrix} = ?$$