

Linear Algebra 2270-2

Due in Week 1

For the first week, it is planned to submit one exercise, in order to get started reading Strang's book. Here is your first exercise, taken from section 1.1 of the textbook.

Exercise 31. Write down three equations for c, d, e so that $c\vec{u} + d\vec{v} + e\vec{w} = \vec{b}$. Can you somehow find the constants c, d and e ?

$$\vec{u} = \begin{pmatrix} 2 \\ -1 \\ 0 \end{pmatrix}, \vec{v} = \begin{pmatrix} -1 \\ 2 \\ -1 \end{pmatrix}, \vec{w} = \begin{pmatrix} 0 \\ -1 \\ 2 \end{pmatrix}, \vec{b} = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}.$$

Opinion

Strang's book is unique among linear algebra textbooks. The orientation is applied mathematics, especially numerical linear algebra. It is presented in a talkative and personal style that represents Gilbert Strang's viewpoint. You can learn a lot from him.

In truth, Strang's textbook is a compendium of ideas, historically credited, often summarized for brevity in the author's own concise style. It is memorable, and to be appreciated even decades after your first reading.

Gauss and Ramanujan were able to think of ideas unimaginable to their contemporaries.



Karl Friedrich Gauss (1777-1855)
Srinivasa Iyengar Ramanujan (1887-1920)



They were distinguished by their need to *create mathematics*, which they accomplished by having *ideas* and exploring them.

Gauss is celebrated as the source from which algebraic and analytic results flowed. His career spanned the years in which linear algebra blossomed, especially determinants and matrices. Gauss elimination is named after him, a topic which you will study in linear algebra. His thesis was the fundamental theorem of algebra. His fundamental work in number theory was before age 24. In applied mathematics, he invented the method of least squares to solve problems in orbital mechanics. Geodesics was next, then probabilistic methods. It is earnestly said that Gauss was probably the greatest mathematician of all time. He caused others to strive for concise proofs and to publish only complete results.

Ramanujan is celebrated because he was a self-taught genius with humble beginnings. If you work in isolation and are sorry for your background, then read about Ramanujan and be inspired.

During 1903-1914, Ramanujan compiled 3,542 theorems in notebooks. His work in number theory and analysis was halted in 1920, dead at age 32. The results are now recognized as fundamental in general theories developed since his death. He is credited for opening new areas of research in mathematics, physics, computer science and statistics.