Math 1433

29 January 2024

Plan for today:

- Problem session
- Quiz 6 (*no* multiplicity, *no* partial fractions)
- “Bonus topics”

Task: Find all the roots of $3x^3 - 23x^2 + 9x + 35$.

Answer: $-1, \frac{5}{3}, 7$

Rational Root Thm: if there is a rational root, it is in the list

$1, -1, 5, -5, 7, -7, 35, -35, \frac{1}{3}, -\frac{1}{3}, \frac{5}{3}, -\frac{5}{3}, \frac{7}{3}, -\frac{7}{3}, \frac{35}{3}, -\frac{35}{3}$

Task: Find the eigenvalues of $\begin{bmatrix} 2 & 4 & 0 \\ 3 & 4 & 3 \\ 2 & 1 & 4 \end{bmatrix}$.

$$\det(M - \lambda I) = 0$$

...

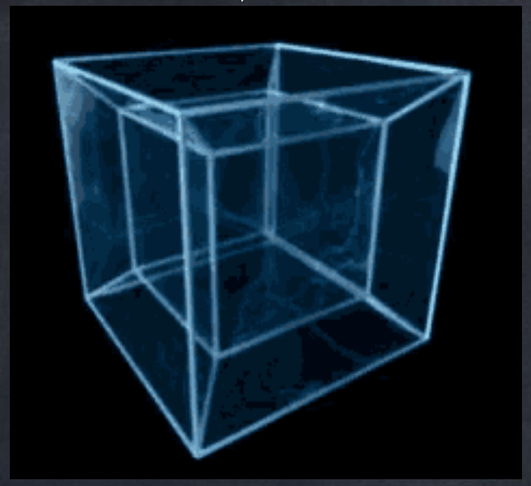
$$(2-\lambda)\big((4-\lambda)(4-\lambda) - 3\big) - 4\big(3(4-\lambda) - 6\big) + 0\big(3 - 2(4-\lambda)\big) = 0$$

...

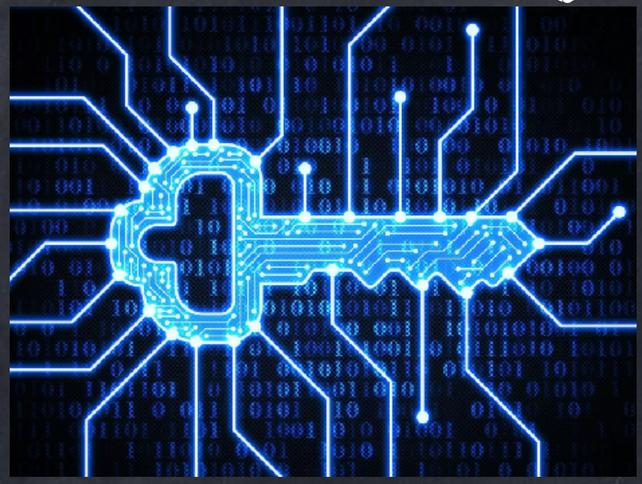
Answer: $2,\ 4+\sqrt{15},\ 4-\sqrt{15}$

These are some nice applications of vectors, matrices, complex numbers, or polynomials.

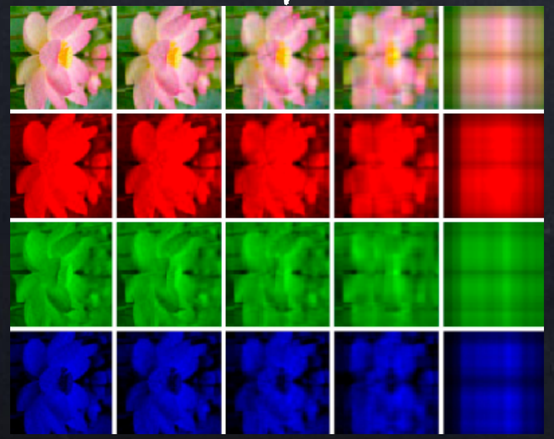
Shadow of a 4D cube



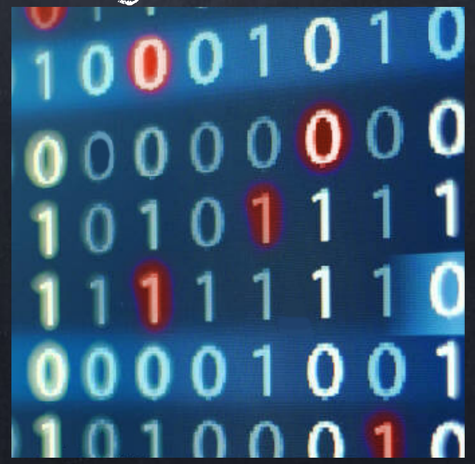
Shamir's secret sharing



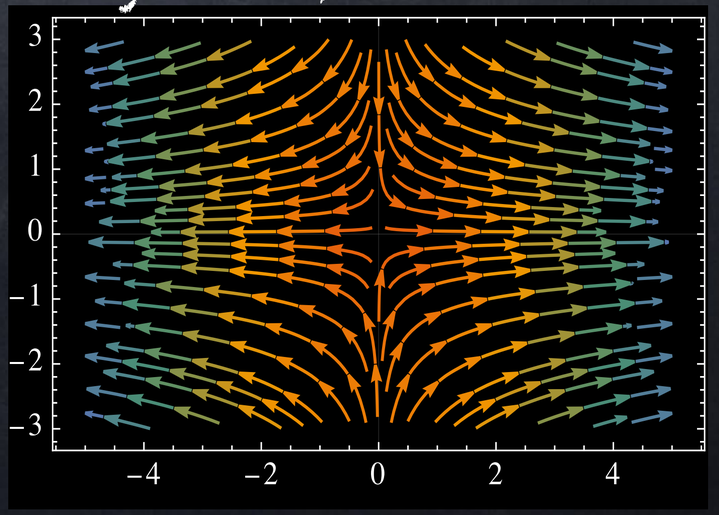
SVD compression



Hamming error correction



Systems of linear ODEs



Celebration of Knowledge 2

The final exam is

Friday 9 February at 10:00 am

Room 311 / B-5

with a second attempt one week later.

Topics:

- Determinants
- Eigenvalues and eigenvectors
- Complex numbers (rectangular form, exponential form, pictures)
- Polynomials (factoring, roots, multiplicity)