RBS Riga Business School
Riga Technical University

The mathematics and computer science in BITL

Why is mathematics important in IT? What technical skills will I learn in BITL?

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1. Why is math important for IT?

2. What will I learn in BITL?

What is IT?

Information technology:

- How to work with information
- How large amounts of information are created, stored, processed, analyzed

Operations management:

- Managing information
- Managing people

In the context of RBS:

- Synonymous with big data & data analysis
- BITL is not a program to create Sys Admins or Dev Ops (though you may work in such roles)

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Which statements describe you? You may choose more than one.

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Why is math important for IT?

Math is important for everyone

- Many students have a bad experience with mathematics teachers in high school / elementary school
- There is no such thing as “natural-born” ability to be “good at math”
- Practicing math (not being good at math!) improves analytical skills

Information technology seems complicated

- Used as a tool by people in power to push their changes on unsuspecting people (e.g. Facebook)
- Misused by people why interpret it to mean what they want, not what it is (e.g. politicians)
- Reinforces the beliefs of those who created it, requires deep knowledge to change

Mathematics is the science of finding the essence in a confusing situation and creating order

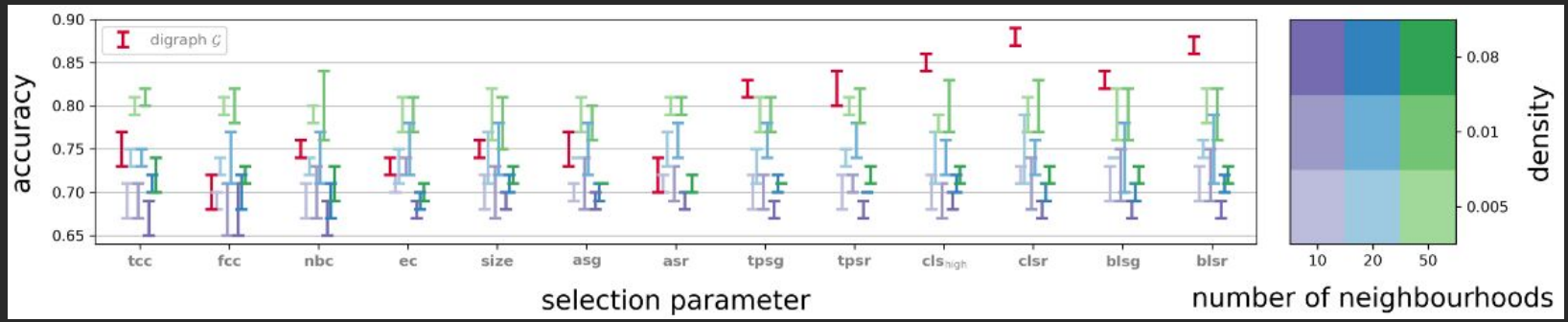
Practical applications*

- *The simplex method in optimization:* create a geometric figure from constraints, move along the boundary to find the best solutions to the constraints
- *Machine learning in medical imaging:* interpret visual patterns as mathematical definitions, train a computer to find them more reliably / accurately than a human
- *Creating financial forecasting models:* analyze huge amounts of data, compress to a single number that the customer can understand
- *Perfecting communications networks:* detect network strengths at a distance, modify the signals (without affecting the transmission) to adapt to dynamic changes

** These may seem simple, unrelated, contrived, not really math - partly true!*

Artificial networks

- 6 million nodes, 40 billion connections
- Replicates ~1mm^2 of a mammal's brain
- 10 seconds of "real time" takes ~24 hours of real time
- Simple basis: binary communication of neurons
- Knowing the effect, what was the cause?



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BITL courses

Mathematics:

- Mathematics 1 & 2 (= College Calculus)
- Discrete Structures (= Combinatorics)
- Linear Algebra
- Statistics

Computer Science:

- Computer Science 1 & 2
- Programming Languages
- Computer Organization
- Algorithm Analysis & Design

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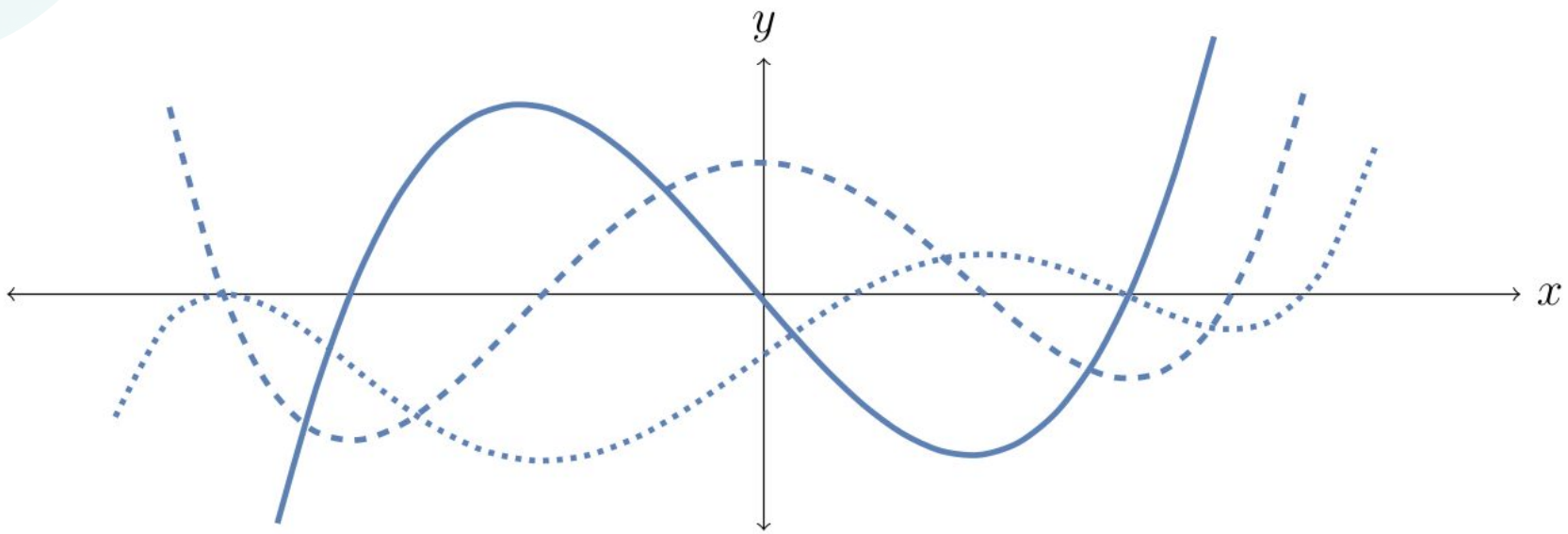
Mathematics 1 & 2: What is going on here? What is the relationship among the functions? Which function is "first"?



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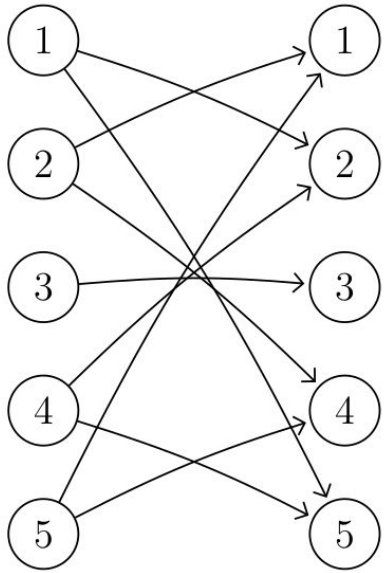
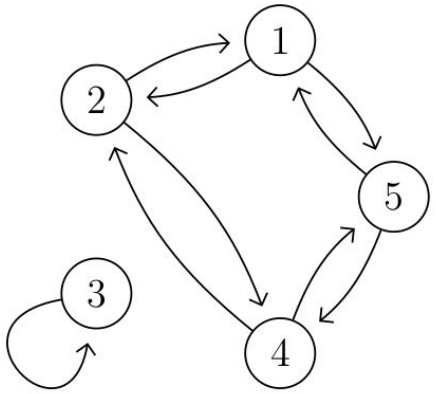
Discrete Structures: What is going on here? What is the relationship among the three visuals? What could it represent?





	1	2	3	4	5
1	F	T	F	F	T
2	T	F	F	T	F
3	F	F	T	F	F
4	F	T	F	F	T
5	T	F	F	T	F

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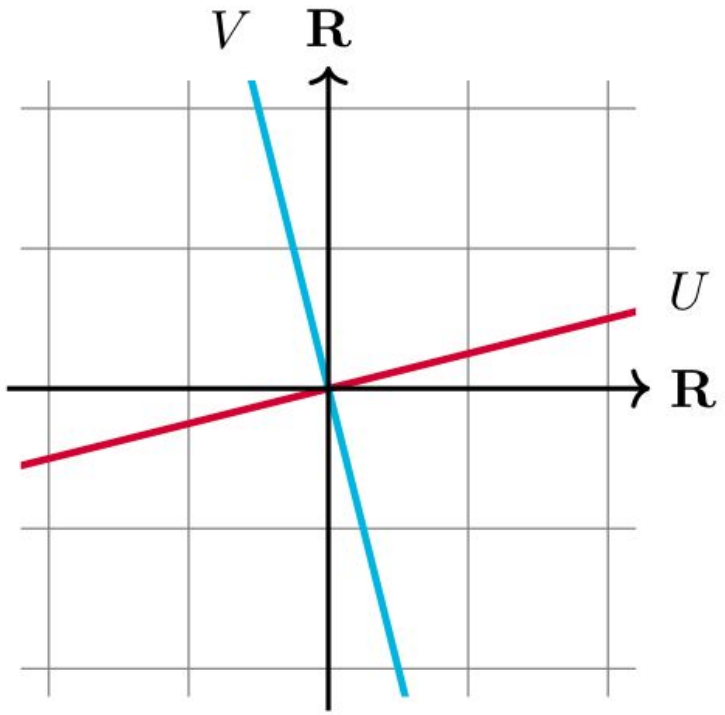
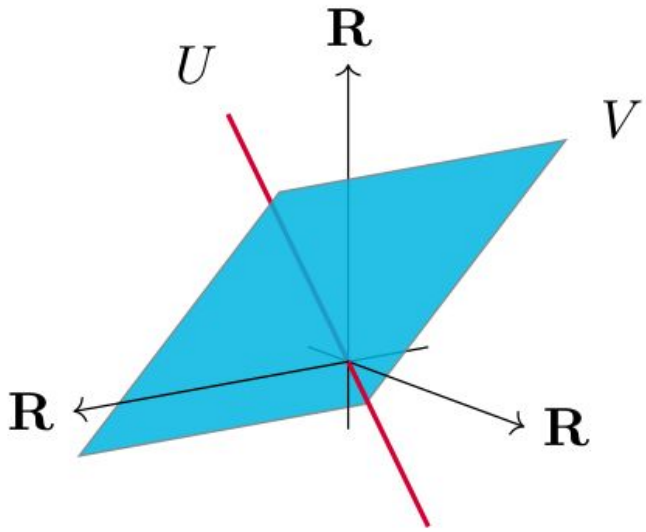
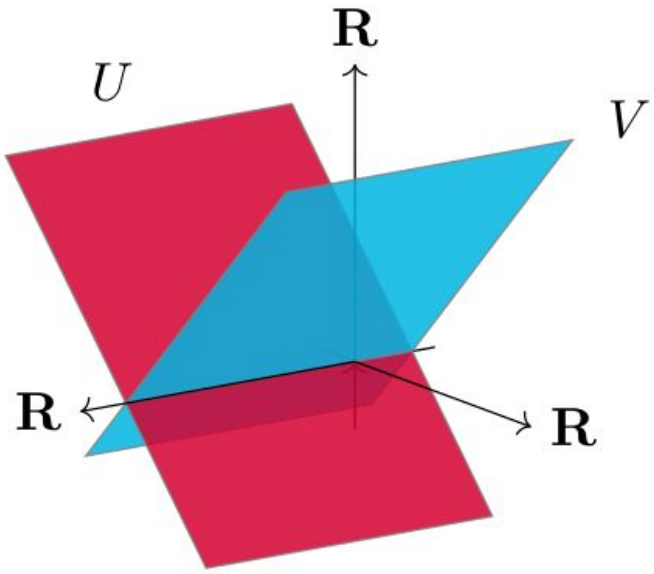
Linear Algebra: What is going on here? Which pictures are similar? How are they similar, how are they different?







Relevant links:

- *The myth of "I'm bad at math"*, The Atlantic (link)
- *Understanding Facebook's EdgeRank,* Buffer blog (link)
- *Racial discrimination in face-detecting technology,* Harvard University (link)
- Financial mathematics: Jim Simons
- Medical mathematics: Gunnar Carlsson
- *BlueBrain Project,* Ecole Polytechnique Federale de Lausanne (link)
- *RBS Introduction to Linear Algebra*, JL (link)