# CS 355: Course Introduction

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# What is this course about?

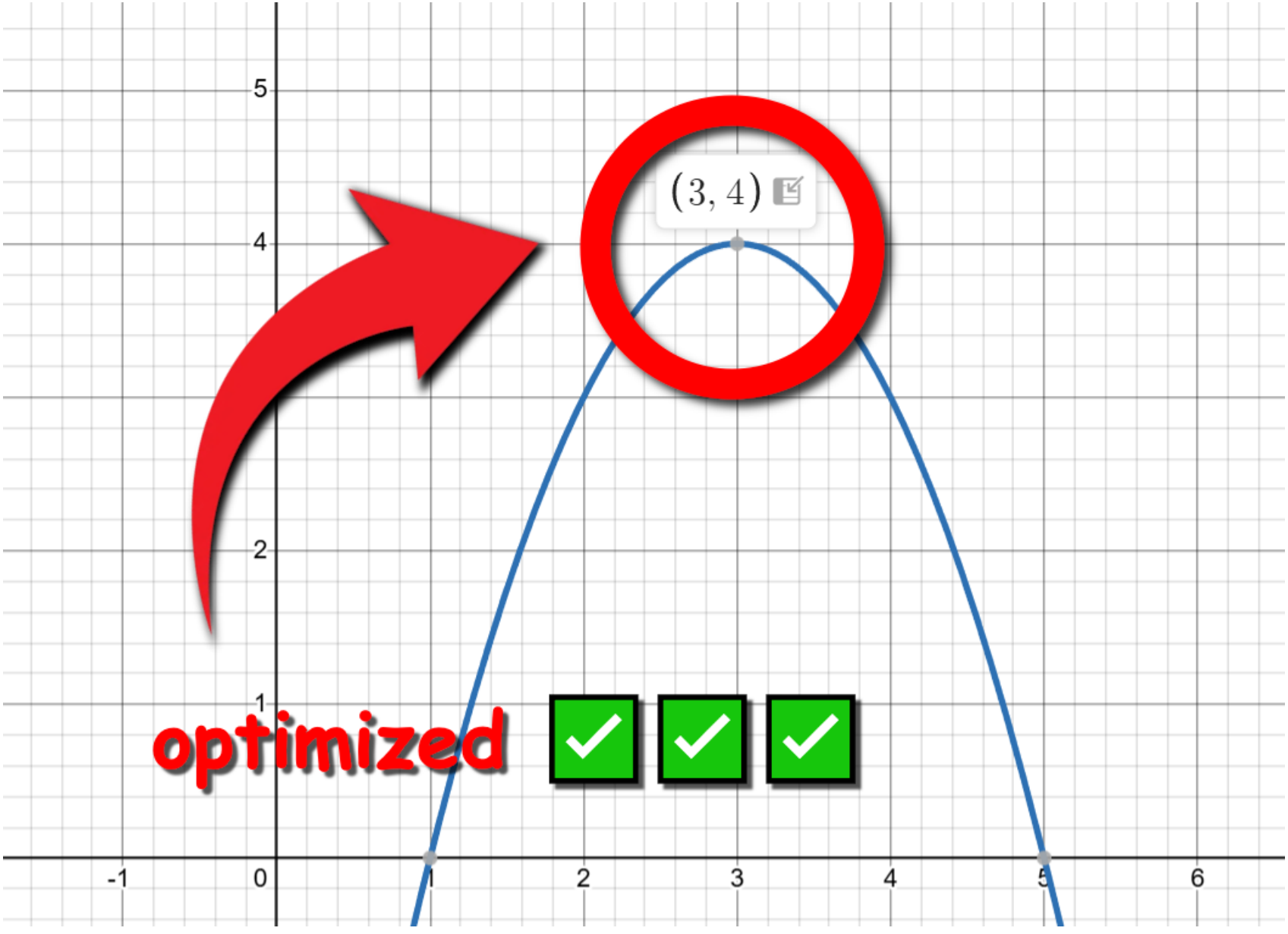
High level:

- Optimization
- Problem solving
- Thinking outside the box
- Proving some things
- What is easy and what is hard (to solve)

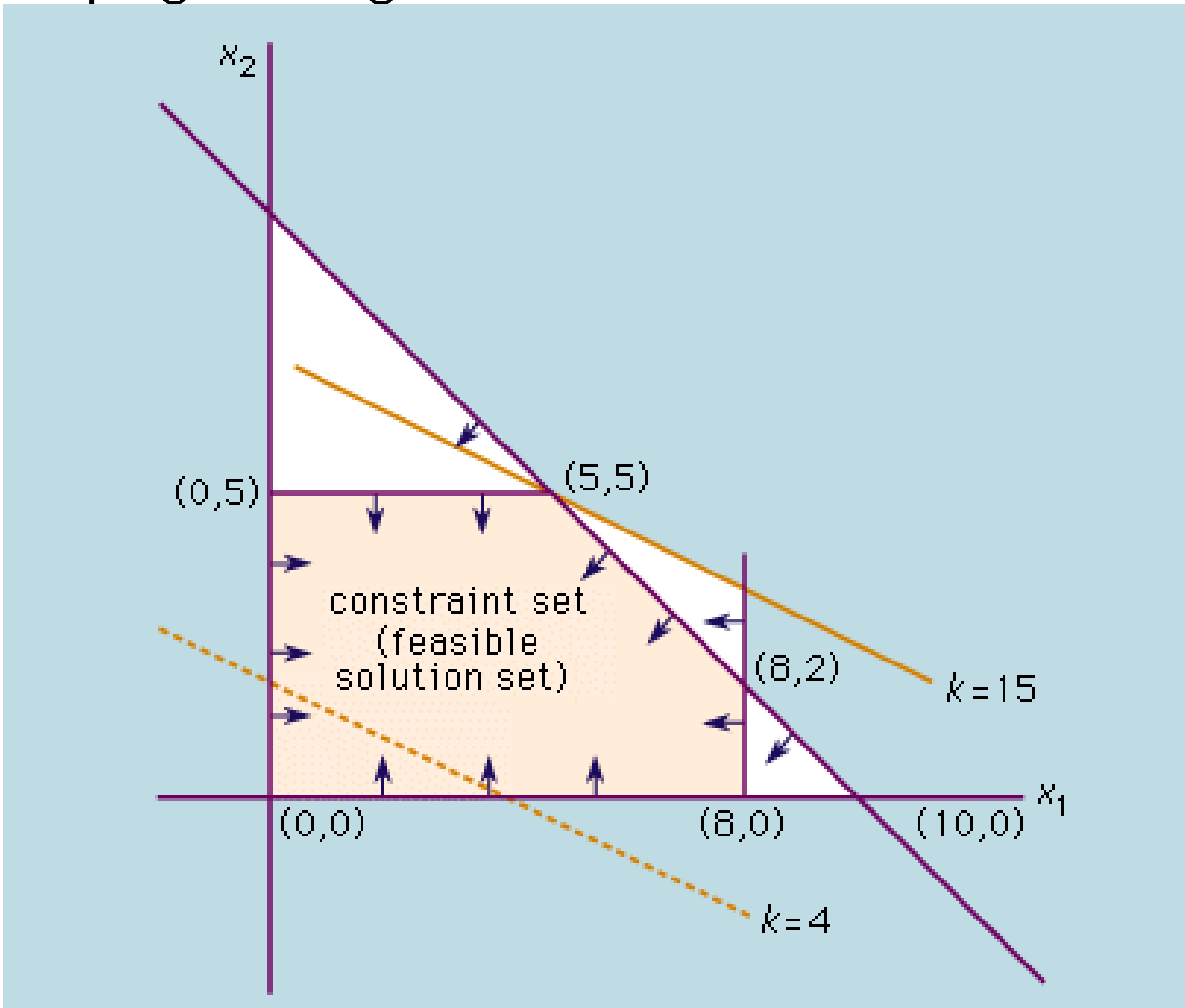
Specific:

- Linear, integer linear, and quadratic "programming"
- Using software that solves these types of problems
- Familiarity with common methods of modeling problems so that they fit into these categories

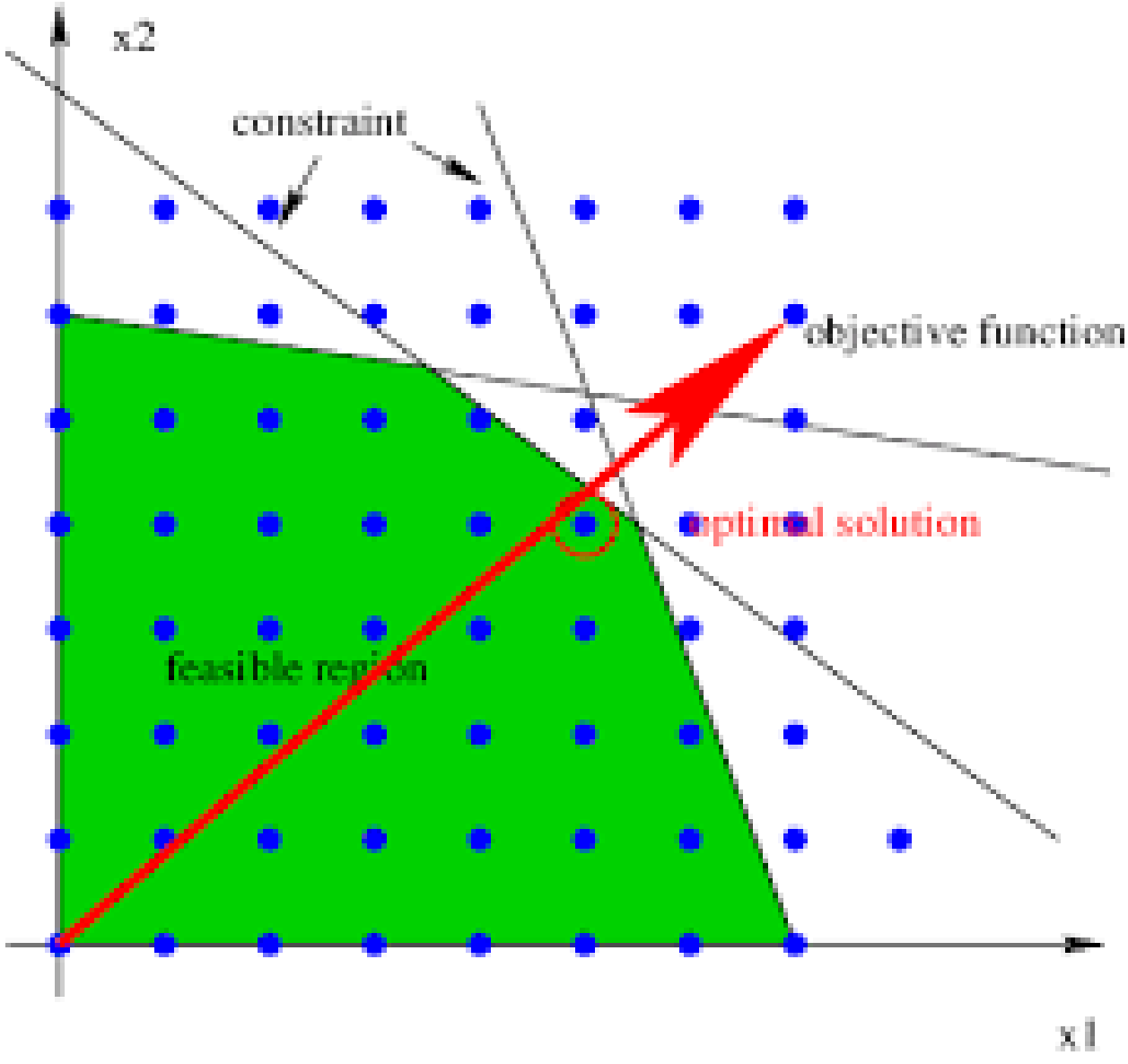
# Optimization



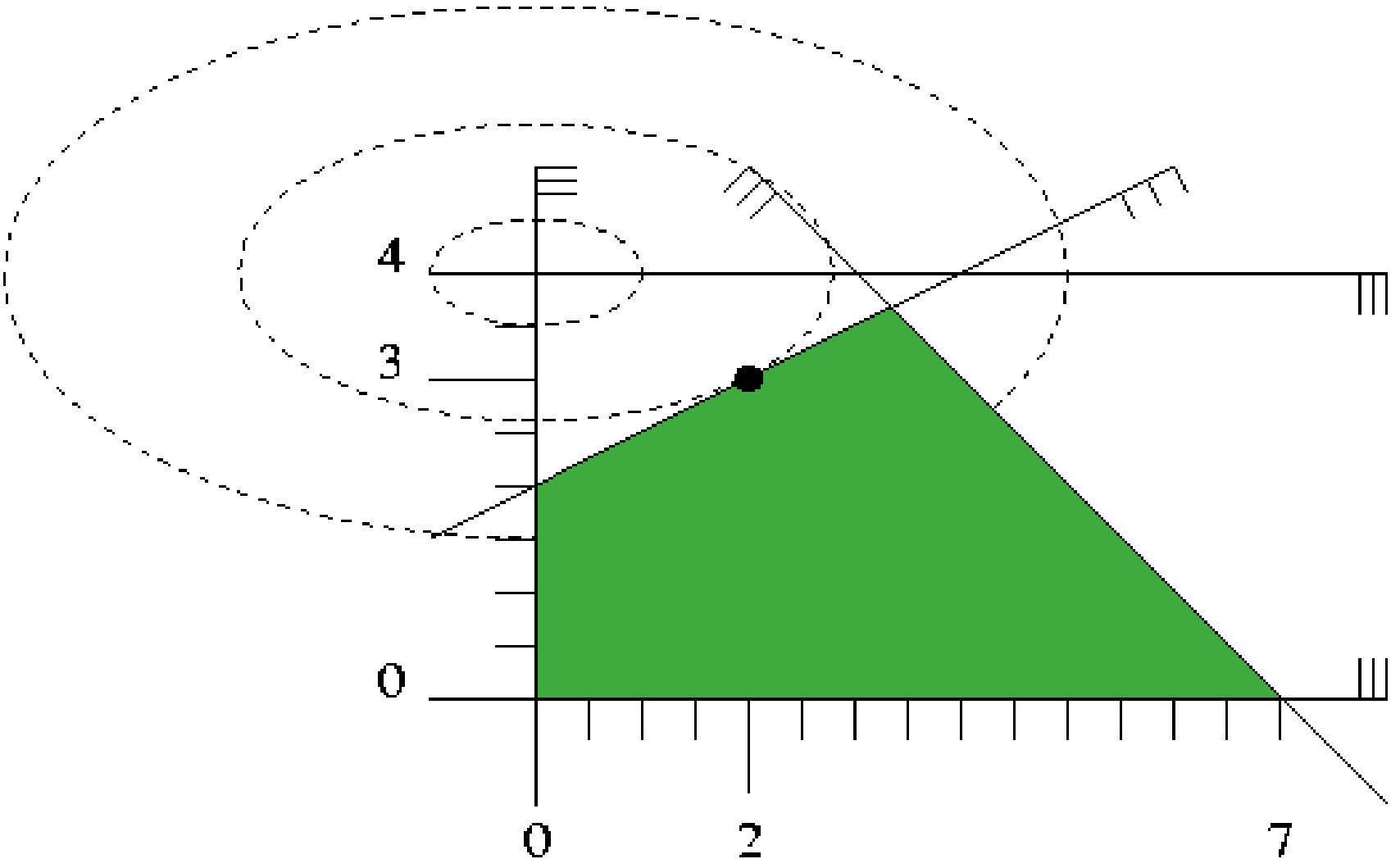
# Linear programming



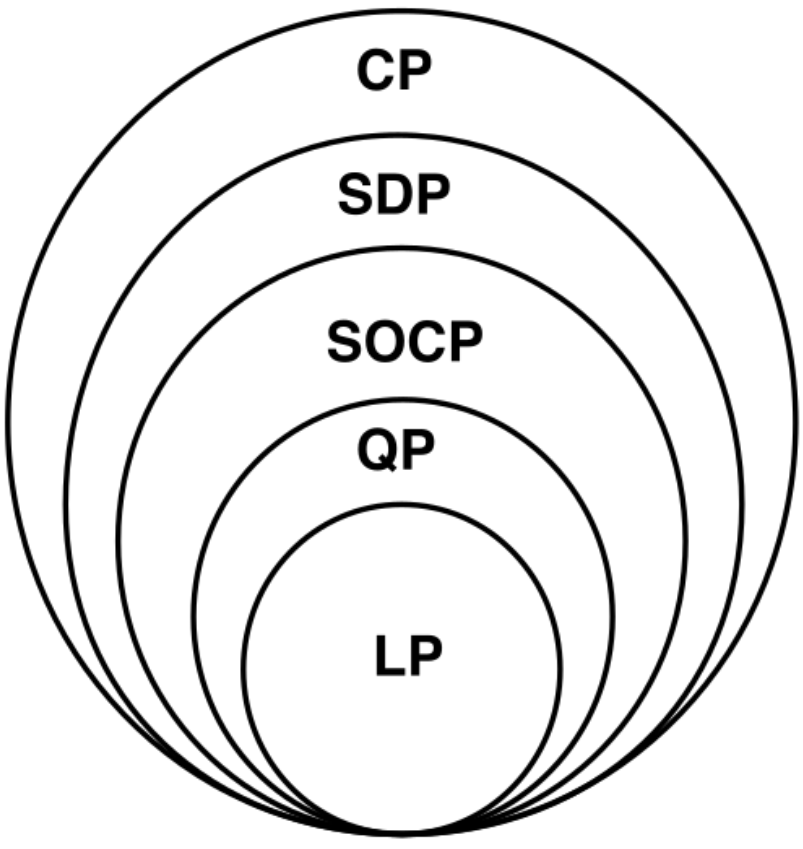
# Integer linear programming



# Quadratic programming



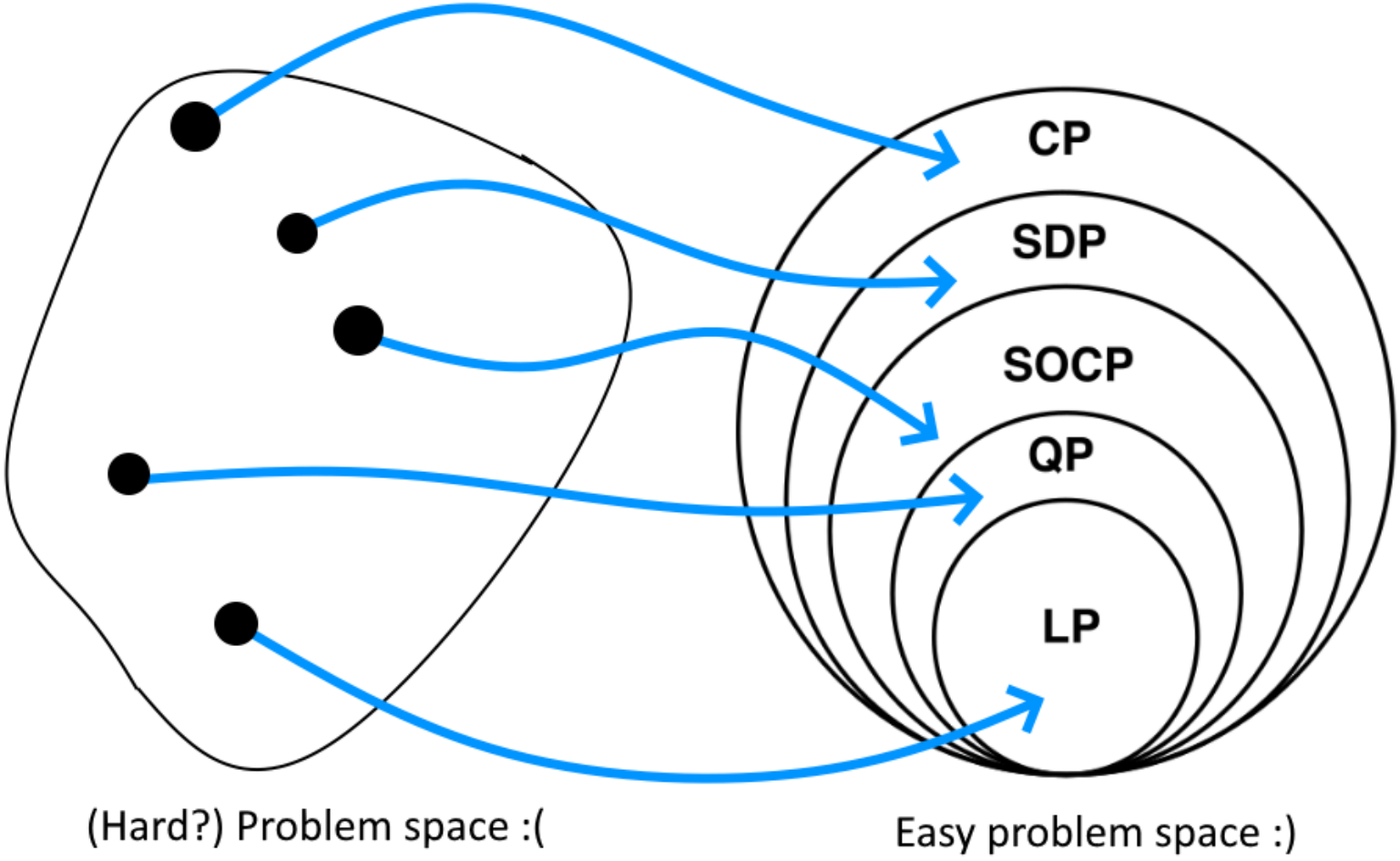
# Convex programming hierarchy



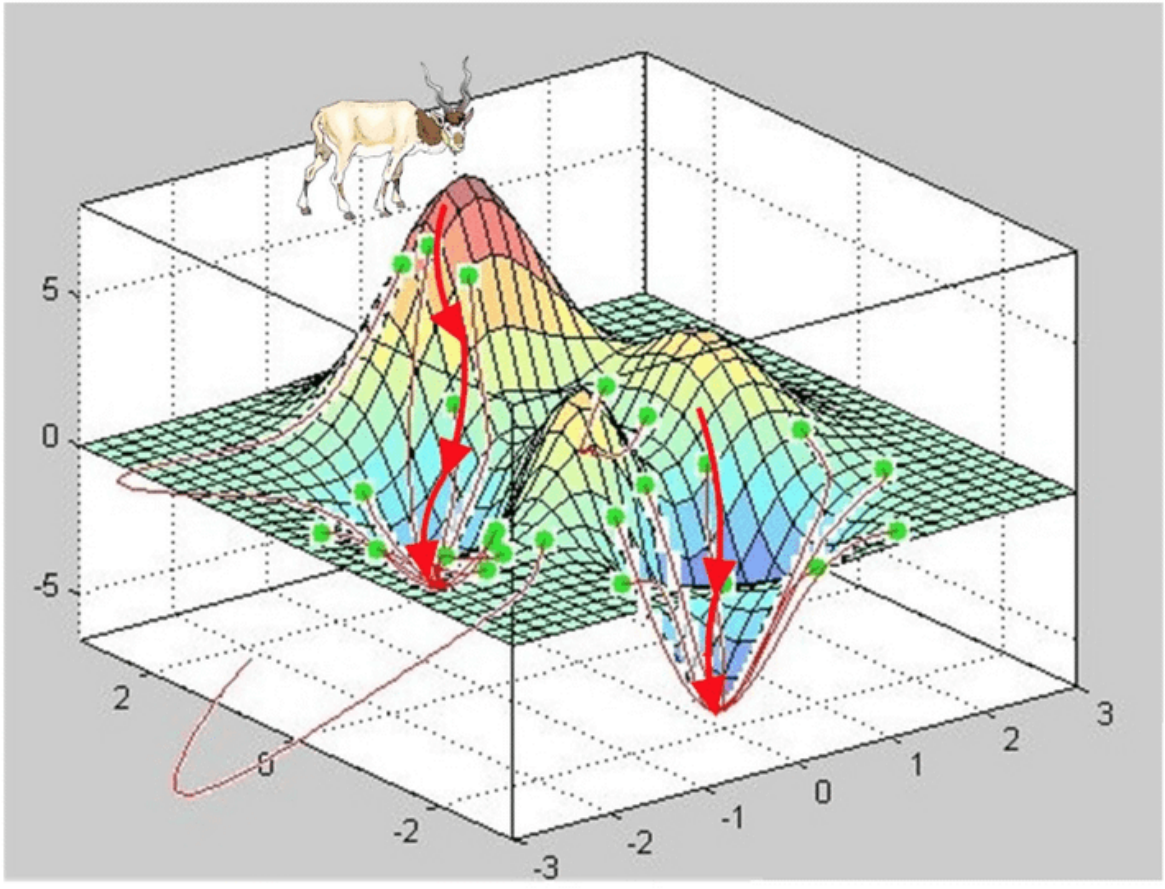

- CP: Convex programming (convex optimization)
- SDP: Semi-definite programming
- SOCP: Second-order cone programming
- QP: Quadratic programming
- LP: Linear programming

# Big picture

- Certain types of problems are easy to solve
- If we transform problems into those formats, we can solve them efficiently (polynomial time)



# Side note: gradient descent




Main differences:

- We have constraints
- Gradient descent is used (mainly?) for non-convex functions

# Prerequisites

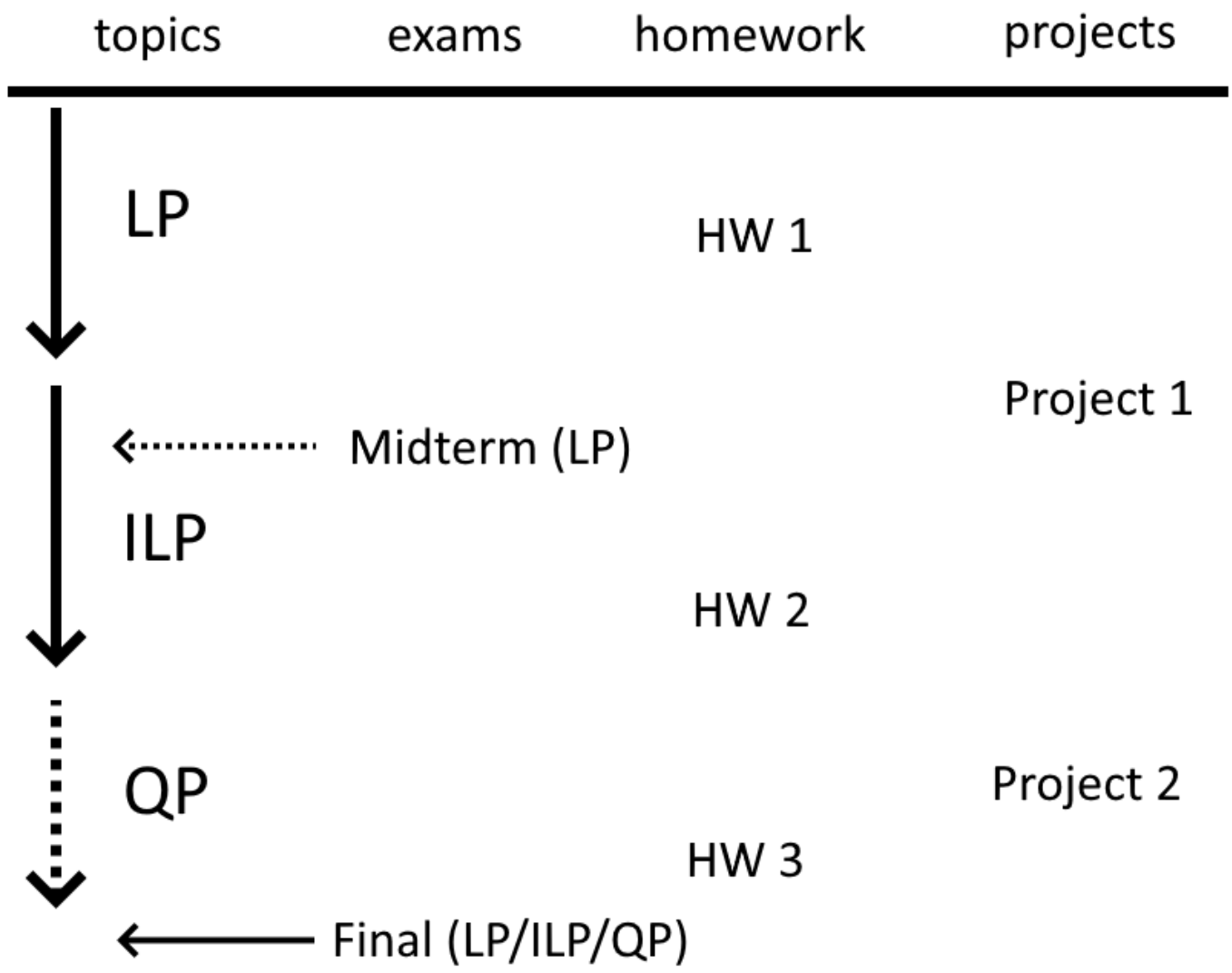
## Need to have (but we will review)

- Python
- Linear algebra/matrix algebra
- "Mathematical maturity"

## Nice to have (but we will also review)

- Multivariable calculus
- Algorithms experience
- Understanding of computational complexity (basically big-O notation)

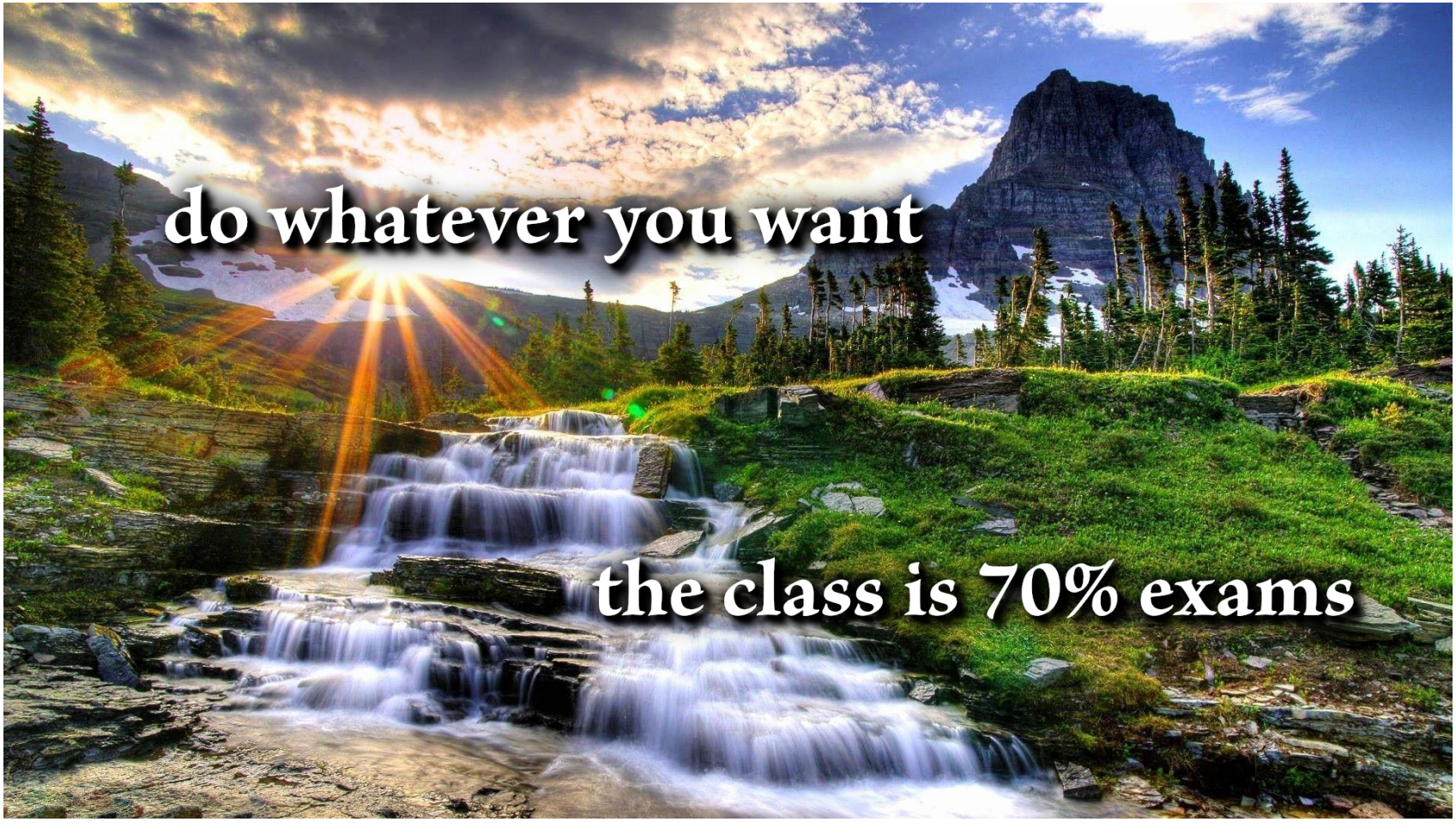
# Semester outline



# Grading

| **Category** | **Weight** |
|---|---|
| Homework | 15% |
| Projects | 15% |
| Midterm exam | 30% |
| Final exam | 40% |

# A note on LLMs and academic integrity



# Logistics

Course materials:

- Homeworks, projects, slides, etc. will be on the course site:
  - https://benrosenberg.info/teaching/sp26/csci35500.html

Submissions:

- Submit assignments on Brightspace
- Please type up your homework, using LaTeX or Word. If I can't read something I can't grade it
- Please submit PDF files

Questions:

- If you have questions, raise your hand during class (preferred) or email me at benjamin.rosenberg24@myhunter.cuny.edu
- If you email me, please put "CS 355" or something similar in the subject line so I can find your emails