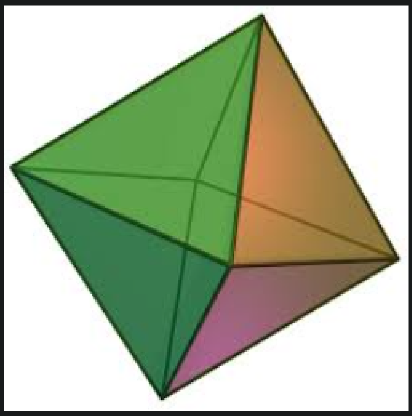
1. What is the minimum number of linear inequalities needed to define the figure pictured below?

1 / 1 point



8

Correct

The figure is cut out by 8 flat surfaces. Thus 8 equations are needed.

2. Given a solution to a linear program, one could try to show that it is optimal by finding a matching solution to the dual program. Which of the following theorems will make it easier to do so?

1 / 1 point

- ○ Polytopes achieve optimum values at vertices.
- ◉ Complementary slackness.
- ○ Separation of convex sets from outside points by hyperplanes.

Correct

Correct! Complementary slackness tells you that your dual solution only uses equations that are tight in solutions to the primal.

3. Which of the following statements are true?

1 / 1 point

- [x] A system of linear equations has always 0, 1, or infinitely many solutions.

Correct

This statement is true. Unless there are no solutions, the solution set has some number of free variables. If there are no free variables, there is a unique solution. If there is at least one free variable, there are infinitely many solutions.

- [x] A system of linear equations has a solution unless they can be combined in some combination to give the equation 0=1.

Correct

This statement is true. There is a solution unless the corresponding row reduced matrix has a row corresponding to this equation, this will happen only if 0=1 can be obtained by combining the original equations.

- [ ] A system of n linear equations in n variables always has a unique solution.

4. Suppose that you are trying to solve the optimization problem:

0 / 1 point

Maximize $v \cdot x$ subject to $Ax \geq b$ for some $A \in \mathbb{R}^{m \times n}$ (i.e. trying to solve an optimization problem in n variables with m linear inequality constraints).

This problem can be reduced to running a solution finding algorithm on a different system of linear equations in k variables. What is the smallest value of k for which this can be done?

8

8

Incorrect

5. What is the largest possible value of x+y achievable by pairs x,y of real numbers satisfying the constraints:

1 / 1 point

- x <= 7
- y <= 10
- 2x+y <= 21
- -x + 2y <= 12
- 5x-y <= 30

15

Correct

Correct. The optimum is at x=6, y=9 as shown below.