1 Exercise

Consider a metabolic network $\mathcal{N}$ given by its stoichiometric $(m \times n)$-matrix $S$ and the set of irreversible reactions $Irr$.

1. What is an elementary flux mode in $\mathcal{N}$?

2. Give a mixed integer linear program to compute a shortest elementary flux mode in $\mathcal{N}$ involving some particular reaction $j_0$ (you may assume $Irr = \{1, \ldots, n\}$).

3. Give a mixed integer linear program to compute $k$ shortest elementary flux mode in $\mathcal{N}$ involving some particular reaction $j_0$ (you may assume $Irr = \{1, \ldots, n\}$).
2 Exercise Tutorial

Consider the following network:

1. Give an inequality description of the steady-state flux cone of $\mathcal{N}$, assuming that all stoichiometric coefficients belong to $\{-1, 0, 1\}$.
2. Determine the elementary modes of $\mathcal{N}$.
3. Determine for all pairs of reactions $i$ and $j$, $i \neq j$, whether $i$ is directionally coupled to $j$.
4. Which pairs of reactions are fully coupled?
Consider the following network:

1. Give an inequality description of the steady-state flux cone of $\mathcal{N}$, assuming that all stoichiometric coefficients belong to $\{-1, 0, 1\}$.

2. Determine the elementary modes of $\mathcal{N}$.

3. Determine for all pairs of reactions $i$ and $j$, $i \neq j$, whether $i$ is directionally coupled to $j$.

4. Which pairs of reactions are fully coupled?
4 Exercise Homework

Consider the following network:

1. Give an inequality description of the steady-state flux cone of $\mathcal{N}$, Assuming that all stoichiometric coefficients belong to $\{-1,0,1\}$.

2. Determine the elementary modes of $\mathcal{N}$.

3. Determine for all pairs of reactions $i$ and $j$, $i \neq j$, whether $i$ is directionally coupled to $j$.

4. Which pairs of reactions are fully coupled?

Justify your answers and send the solutions for exercise 3 and 4 until Friday, 16. June, 08:00 am to Annika.Roehl@fu-berlin.de