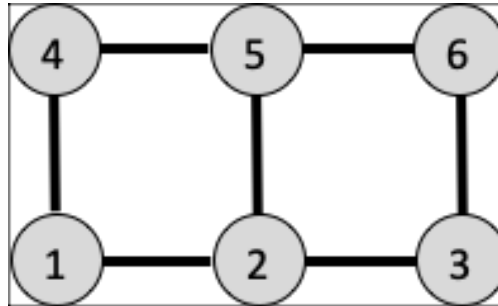


Assignment 10

Computational Medicine: Cardiology

(20 points)

Problem 1. (9 pts) Define the unweighted graph adjacency (A), degree (D) and Laplacian (L) matrices for the undirected graph below.



Problem 2. (11 pts) Using the provided python code, solve the heat equation using the forward Euler method on the graph from (1). See instructions below for installing Python and the required libraries.

$$\frac{dT}{dt} = -L T$$

$$\rightarrow T[t + \Delta t] = T[t] - \Delta t L T$$

Assume that all nodes have zero temperature except node 1, use $\Delta t=0.01$.

- Provide a figure of the solution at $t_{\text{step}} = 0, 50, \& 100$.
- At $t_{\text{step}}=0, 50, \& 100$, what is the mean temperature and standard deviation of the temperature?



Install Python (if you don't currently have it): [Download and install the required package for your operating system.](#)

Install Visual Studio Code (Or feel free to use any code editor you prefer/already have): [Download and install the required package for your operating system.](#)

Install pip (Skip to next section if already installed): Run the get-pip.py script in your terminal:

MacOS: `python3 get-pip.py`

Linux: `python get-pip.py`

Windows: `py get-pip.py`

Install networkx open source graph library: Networkx is an open source graph library. That can help make graphs but uses lists of edges and nodes as inputs and will compute the adjacency, degree, and Laplacian matrices.

`pip install networkx[default]`

