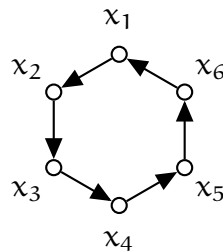# 2021F Math585 Midterm1

4 questions, 20 total points
Note: Use other papers to answer the problems. Remember to write down your **name** and your **student ID #**.

1. [5pt] The weighted digraph below represents a matrix, where each edge has weight 1, while the numbers $x_1, \ldots, x_6$ nearby the nodes represent a vector. Find the product of the matrix and the vector, and then draw the product.

2. [5pt] Let

$$A = \begin{bmatrix} 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 & 1 \end{bmatrix}.$$

Find the $1, 1$-entry of A^5 and the $1, 1$-entry of A^{100}.

3. [5pt] Let A be the matrix as in Problem 2. Find $\det(A)$.

4. [5pt] Let A be the matrix as in Problem 2. Find the characteristic polynomial $\det(A - xI)$.