

CS251: Homework #6

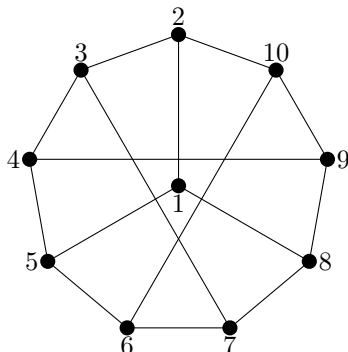
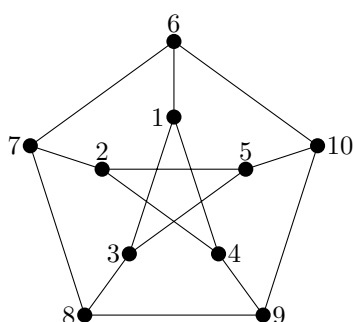
Due on December 3, 2019 at 2:00pm

Steven Libby Section A

Austen Nelson

Problem 1

The table provides a function that defines an isomorphism between the graphs.

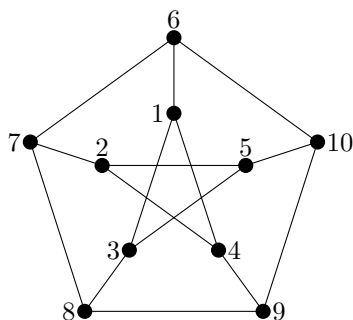


Left	Right
1	6
2	3
3	5
4	7
5	4
6	10
7	2
8	1
9	8
10	9

Problem 2

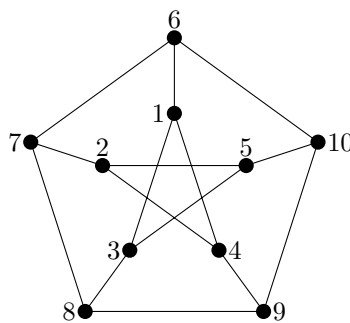
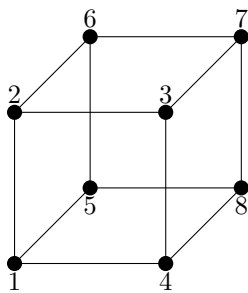
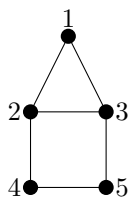
The table provides a 3 coloring of the graph using the colors a, b, and c.

The chromatic number cannot be 2 because C_5 is a subgraph.



Vertex	Color
1	a
2	c
3	c
4	b
5	b
6	b
7	a
8	b
9	c
10	a

Problem 3



Graph	Edge List	Adjacency List	Adjacency Matrix
left	$\begin{bmatrix} 1 \leftrightarrow 2 \\ 1 \leftrightarrow 3 \\ 2 \leftrightarrow 3 \\ 2 \leftrightarrow 4 \\ 3 \leftrightarrow 5 \\ 4 \leftrightarrow 5 \end{bmatrix}$	$\begin{bmatrix} 1 \rightarrow 2, 3 \\ 2 \rightarrow 1, 3, 4 \\ 3 \rightarrow 1, 2, 5 \\ 4 \rightarrow 2, 5 \\ 5 \rightarrow 3, 4 \end{bmatrix}$	$\begin{bmatrix} 0 & 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 & 0 \\ 1 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 \end{bmatrix}$
middle	$\begin{bmatrix} 1 \leftrightarrow 2 \\ 1 \leftrightarrow 4 \\ 1 \leftrightarrow 5 \\ 2 \leftrightarrow 3 \\ 2 \leftrightarrow 6 \\ 3 \leftrightarrow 4 \\ 3 \leftrightarrow 7 \\ 4 \leftrightarrow 8 \\ 5 \leftrightarrow 6 \\ 5 \leftrightarrow 8 \\ 6 \leftrightarrow 7 \\ 7 \leftrightarrow 8 \end{bmatrix}$	$\begin{bmatrix} 1 \rightarrow 2, 4, 5 \\ 2 \rightarrow 1, 3, 6 \\ 3 \rightarrow 2, 4, 7 \\ 4 \rightarrow 1, 3, 8 \\ 5 \rightarrow 1, 6, 8 \\ 6 \rightarrow 2, 5, 7 \\ 7 \rightarrow 3, 6, 8 \\ 8 \rightarrow 4, 5, 7 \end{bmatrix}$	$\begin{bmatrix} 0 & 1 & 0 & 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 & 0 \end{bmatrix}$
right	$\begin{bmatrix} 1 \leftrightarrow 3 \\ 1 \leftrightarrow 4 \\ 1 \leftrightarrow 6 \\ 2 \leftrightarrow 4 \\ 2 \leftrightarrow 5 \\ 2 \leftrightarrow 7 \\ 3 \leftrightarrow 5 \\ 3 \leftrightarrow 8 \\ 4 \leftrightarrow 9 \\ 5 \leftrightarrow 10 \\ 6 \leftrightarrow 7 \\ 6 \leftrightarrow 10 \\ 7 \leftrightarrow 8 \\ 8 \leftrightarrow 9 \\ 9 \leftrightarrow 10 \end{bmatrix}$	$\begin{bmatrix} 1 \rightarrow 3, 4, 6 \\ 2 \rightarrow 4, 5, 7 \\ 3 \rightarrow 1, 5, 8 \\ 4 \rightarrow 1, 2, 9 \\ 5 \rightarrow 2, 3, 10 \\ 6 \rightarrow 1, 7, 10 \\ 7 \rightarrow 2, 6, 8 \\ 8 \rightarrow 3, 7, 9 \\ 9 \rightarrow 4, 8, 10 \\ 10 \rightarrow 5, 6, 9 \end{bmatrix}$	$\begin{bmatrix} 0 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 & 0 & 0 & 1 & 0 \end{bmatrix}$

Problem 4

	Step 0	Step 1	Step 2	Step 3	Step 4
Operation	Start	Push(5)	Pop	Push(3)	Pop
Heap	<pre> 4 / \ 7 8 / \ 10 9 11 </pre>	<pre> 4 / \ 7 5 / \ / \ 10 9 11 8 </pre>	<pre> 5 / \ 7 8 / \ 10 9 11 </pre>	<pre> 3 / \ 7 5 / \ / \ 10 9 11 8 </pre>	<pre> 5 / \ 7 8 / \ 10 9 11 </pre>
Array	$\begin{bmatrix} 4 \\ 7 \\ 8 \\ 10 \\ 9 \\ 11 \end{bmatrix}$	$\begin{bmatrix} 4 \\ 7 \\ 5 \\ 10 \\ 9 \\ 11 \\ 8 \end{bmatrix}$	$\begin{bmatrix} 5 \\ 7 \\ 8 \\ 10 \\ 9 \\ 11 \end{bmatrix}$	$\begin{bmatrix} 3 \\ 7 \\ 5 \\ 10 \\ 9 \\ 11 \\ 8 \end{bmatrix}$	$\begin{bmatrix} 5 \\ 7 \\ 8 \\ 10 \\ 9 \\ 11 \end{bmatrix}$