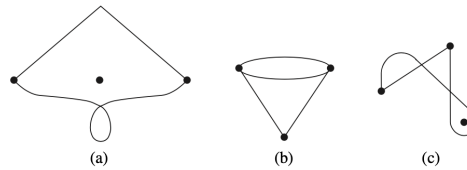


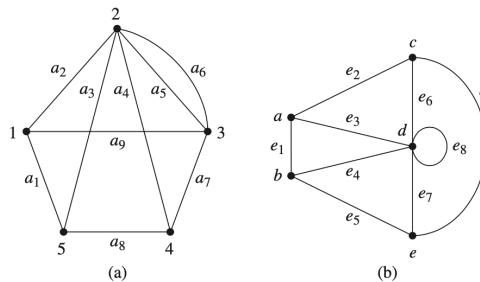
```
In [1]: ### CSCI-3080 Discrete Structure
### OLA 4: Chapter 6 -- Graphs and Trees
### Name:
### Student ID:
### Date:
```

**1. Which of the following graphs is not isomorphic to the others, and why?**



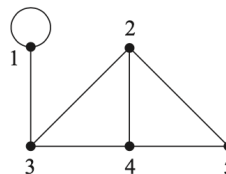
b is not isomorphic to the others. Because b doesnot have an isolated node. a and c do have an isolated node.

**2. Decide if the two graphs are isomorphic. If so, give the function or functions that establish the isomorphism; if not, explain why.**



They are not isomorphic, because graph b has a loop and graph a does not.

**3. Write the adjacency matrix for the given graph.**

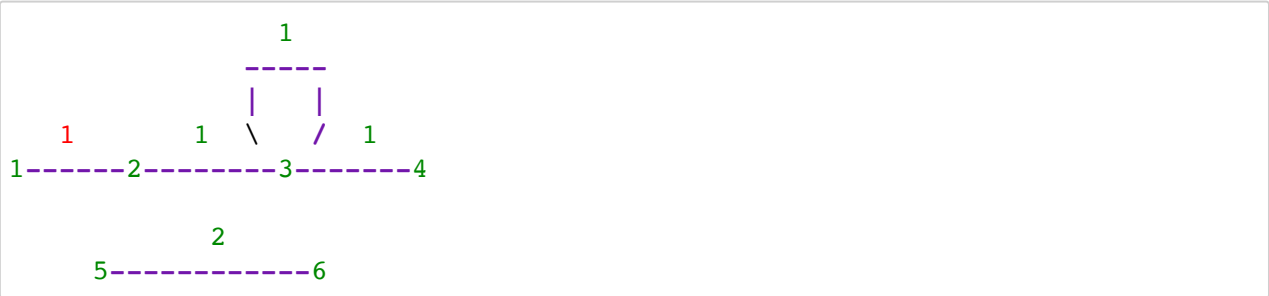


$$\begin{pmatrix} 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 \\ 1 & 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{pmatrix}$$

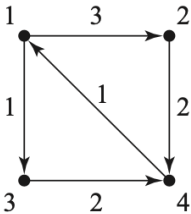
4. Draw the weighted graph represented by the following adjacency matrix.

$$\begin{pmatrix} 0 & 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 0 & 2 & 0 \end{pmatrix}$$

In [ ]:



5. Write the adjacency list representation for the given weighted directed graph.



In [ ]:

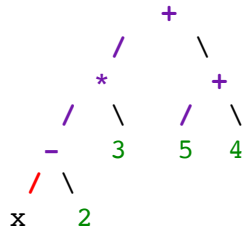
```
1 | | --> | 2 | 3 | | --> | 3 | 1 | . |
2 | | --> | 4 | 2 | . |
3 | | --> | 4 | 2 | . |
4 | | --> | 1 | 1 | . |
```

## 6. Please draw the expression tree for the expression:

$$[(x - 2) * 3] + (5 + 4)$$

1. Please draw the expression binary tree
2. Write the list of nodes resulting from a **preorder** traversal, an **inorder** traversal, and a **postorder** traversal of the given tree

In [ ]:



In [ ]: preorder: + \* - x 2 3 + 5 4  
 inorder: x - 2 \* 3 + 5 + 4  
 postorder: x 2 - 3 \* 5 4 + +

## 7. Given the codes:

character	b	h	q	w	%
encoding	1000	1001	0	11	101

- (1) decode the sequence 10001001101101
- (2) decode the sequence 11110
- (3) decode the sequence 01001111000

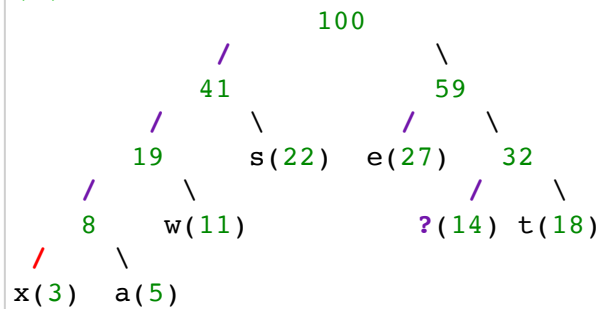
(1) b h % % (2) w w q (3) q h w b

## 8.

Character	?	x	w	e	t	s	a
Frequency	14	3	11	27	18	22	5

- (1) Please construct the Huffman tree for the following characters and frequencies.
- (2) Please find the Huffman codes for these characters.
- (3) A file consisting of 100,000 instances of these seven characters is stored using a fixed-length binary encoding scheme. How many bits are required for each code and what is the total number of bits needed?
- (4) Storing the same file using the Huffman code in (2), how many bits are needed?

In [ ]: (1)



In [ ]: (2)

```

? 110
x 0000
w 001
e 10
t 111
s 01
a 0001

```

In [ ]: (3)

There are 7 different characters.  $2^3 = 8$ . We need 3 bits **for** the fixed-length binary encoding scheme. In total, it needs  $3 * 100,000 = 300,000$  bits

In [ ]: (4)

```

?: 3*100000*0.14 = 42000
x: 4*100000*0.03 = 12000
w: 3*100000*0.11 = 33000
e: 2*100000*0.27 = 54000
t: 3*100000*0.18 = 54000
s: 2*100000*0.22 = 44000
a: 4*100000*0.05 = 20000

total: 42000 + 12000 + 33000 + 54000 + 54000 + 44000 + 20000 = 259000

```