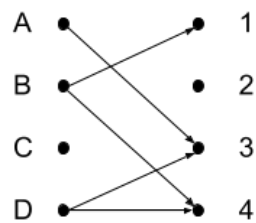


Discrete Mathematics Quiz 6

Name: _____

NYU Net ID: _____

1.1) Select the set that corresponds to the relation given in the arrow diagram below:



- *a. $\{ (A, 3), (B, 1), (B, 4), (D, 3), (D, 4) \}$
- b. $\{ (A, 3), (B, 1), (B, 2), (D, 3), (D, 4) \}$
- c. $\{ (1, B), (3, A), (3, D), (4, B), (4, D) \}$
- d. $\{ (1, B), (2, B), (3, A), (3, D), (4, D) \}$

1.2) Select the set that corresponds to the relation given in the matrix representation below.
Rows of the matrix are numbered 1 through 4 from top to bottom and columns are numbered 1 through 4 from left to right.

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

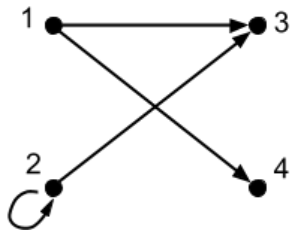
- a. $\{ (2, 1), (2, 2), (3, 3), (4, 2) \}$
- b. $\{ (1, 2), (2, 3), (2, 4), (3, 3) \}$
- *c. $\{ (1, 2), (2, 2), (2, 4), (3, 3) \}$
- d. $\{ (2, 1), (2, 2), (3, 3), (3, 4) \}$

1.3) A relation R is given in the matrix representation below. Rows of the matrix are numbered 1 through 4 from top to bottom and columns are numbered 1 through 4 from left to right. Select the expression that is false.

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

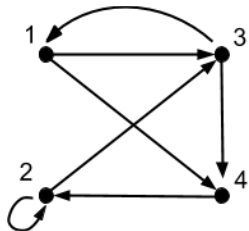
- a. 2R2
- b. 3R4
- c. 4R1
- *d. 4R3

1.4) Select the set that corresponds to the relation given in the arrow diagram below:



- a. $\{ (1, 3), (1, 4), (2, 3) \}$
- b. $\{ (1, 3), (1, 4), (3, 2) \}$
- *c. $\{ (1, 3), (1, 4), (2, 3), (2, 2) \}$
- d. $\{ (1, 3), (1, 4), (3, 2), (2, 2) \}$

2.1) Graph G is defined by the arrow diagram below.

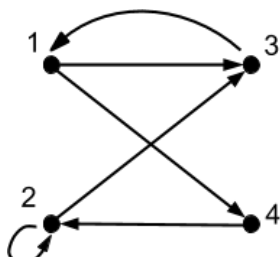


Select the properties that accurately describe the following sequence with respect to graph G:

$\langle 2, 3, 1, 3, 4 \rangle$

- a. Not a walk
- b. A walk but not a trail
- *c. A trail but not a path
- d. A trail and a path

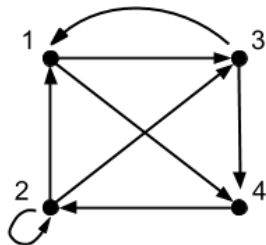
2.2) Graph G is defined by the arrow diagram below.



Select the pair of vertices such that there is no walk of length 4 in G from the first vertex to the second vertex.

- a. 1, 3
- *b. 1, 4
- c. 2, 1
- d. 4, 3

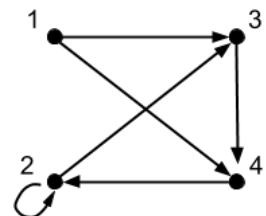
2.3) Graph G is defined by the arrow diagram below.



What is the out-degree of vertex 2?

- a. 1
- b. 2
- *c. 3
- d. 5

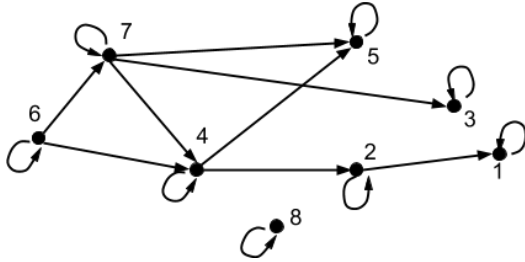
2.4) Graph G is defined by the arrow diagram below.



Select the statement about G that is false.

- a. G has a cycle of length 1
- b. G has a cycle of length 3
- c. G has a circuit of length 4
- *d. G has a circuit of length 5

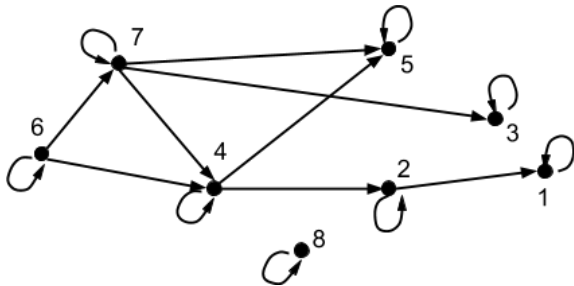
3.1) The figure below shows an arrow diagram for a partial relation:



What are the maximal elements in the partial order?

- a. 7, 8
- b. 1, 3, 5
- *c. 1, 3, 5, 8
- d. 1, 2, 3, 5, 8

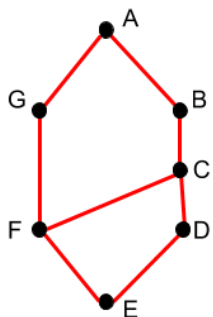
3.2) The figure below shows an arrow diagram for a partial relation:



Which elements are not comparable to 4?

- a. 1, 2
- *b. 3, 8
- c. 2, 6, 8
- d. 1, 2, 8

3.3) The figure below is a Hasse diagram for a partial order:

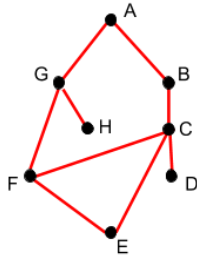


Which elements are not comparable to F?

- *a. D
- b. B, D
- c. A, B, D

d. A, B, D, F

3.4) The figure below is a Hasse diagram for a partial order:



What are the minimal elements?

- a. E
- b. E, D
- *c. E, D, H
- d. E, D, F, H

4.1) The domain of relation R is the set of all integers. xRy if $|x - y| \leq 1$. Which statement correctly characterizes the relation R ?

- a. R is an equivalence relation.
- b. R is not an equivalence relation because R is not reflexive.
- c. R is not an equivalence relation because R is not symmetric.
- *d. R is not an equivalence relation because R is not transitive.

4.2) The domain of relation R is $\mathbb{Z} \times \mathbb{Z}$. $(a, b)R(c, d)$ if $a = c$ or $b = d$ or both. Which statement correctly characterizes the relation R ?

- a. R is an equivalence relation.
- b. R is not an equivalence relation because R is not reflexive.
- c. R is not an equivalence relation because R is not symmetric.
- *d. R is not an equivalence relation because R is not transitive.

4.3) The domain of relation R is $\mathbb{Z} \times \mathbb{Z}$. $(a, b)R(c, d)$ if $a \leq c$ and $b \leq d$. Which statement correctly characterizes the relation R ?

- a. R is an equivalence relation.
- b. R is not an equivalence relation because R is not reflexive.
- *c. R is not an equivalence relation because R is not symmetric.
- d. R is not an equivalence relation because R is not transitive.

4.4) The domain of relation R is $Z \times Z$. $(a, b)R(c, d)$ if $a - b = c - d$. Which statement correctly characterizes the relation R?

- *a. R is an equivalence relation.
- b. R is not an equivalence relation because R is not reflexive.
- c. R is not an equivalence relation because R is not symmetric.
- d. R is not an equivalence relation because R is not transitive.

5) Below is a database showing the daily train schedule for a train station.

Departure Time	Destination	Track	Local/Express
8:00AM	Brussels	1	Express
9:15AM	Helsinki	2	Local
9:22AM	Munich	1	Local
9:32AM	Helsinki	1	Express
11:00AM	Amsterdam	1	Express
11:17AM	Helsinki	2	Local
11:44AM	Amsterdam	2	Local

What series of operations should be performed in order to get the departure times of all the Express trains to Amsterdam?

Answer.

```
SELECT[Destination = "Amsterdam" and Express/Local = "Express"]  
PROJECT[Departure Time]
```