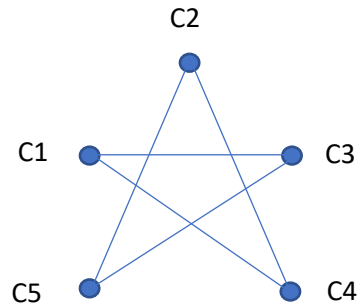
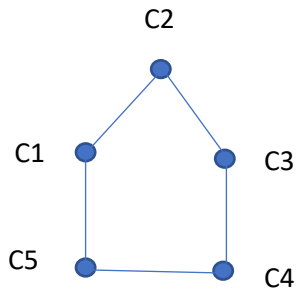


1) What is the correct statement about the following 2 graphs?



Select one:

- ☒ 1. Two graphs are isomorphic
- ☐ 2. Two graphs are not isomorphic
- ☐ 3. The two graphs have different degree sequences
- ☐ 4. None of the above

2) Consider the following linear system

$$x + y + z = 0$$

$$2x + 3y + z = 4$$

$$x - 3y + 2z = -10$$

$$x = \frac{|A1|}{|A|} \quad y = \frac{|A2|}{|A|} \quad z = \frac{|A3|}{|A|}$$

Find the following.

$$|A1| =$$

$$|A2| =$$

$$|A3| =$$

$$|A| =$$

$$x =$$

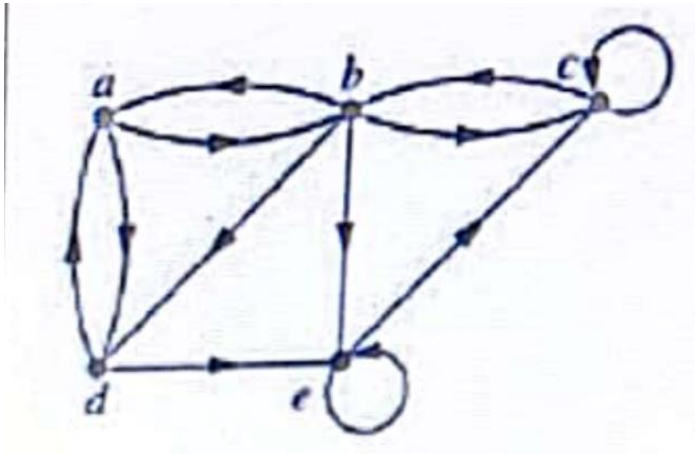
$$y =$$

$$z =$$

$$\begin{aligned} |A3| &= 6 \\ |A2| &= -6 \\ |A1| &= 0 \\ |A| &= -3 \end{aligned}$$

$$\begin{aligned} 0 \\ 2 \\ -2 \end{aligned}$$

3) Consider the following Directed Graph



Number of edges = 12

Total Indegree = 12

Total outdegree = 12

4) Number of edges in graph G is 8. Assume that there are 4 vertices with equal degree values.

Total degree = 16

Degree of a one vertex = 4

Does an Euler Circuit exist in G? yes/no yes

Does an Euler Path in G? yes/no no

Number of components of G = 1

5) Following adjacency matrix represents a graph

	a	b	c	d
a	1	0	0	2
b	1	1	0	1
c	0	1	0	1
d	0	0	0	1

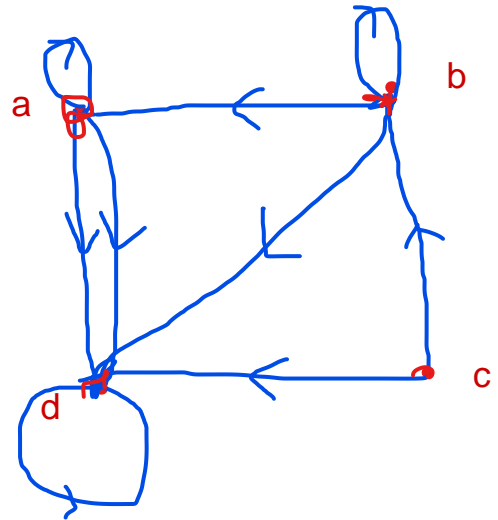
This graph is a **Directed Graph** Because matrix is not a Symmetric matrix

- ☐ Undirected Graph
- ☒ Directed Graph

Number of loops: 3

Number of Edges: 9 (All element)

Number of Vertices: 4



6) $A = 100101101 + 100110101$
Find the 2's Complement of A **0110011110**

7) Find $f'(2)$

$$f(x) = 3/x^4 - 2x^2 + 6x - 7.$$

-19/8

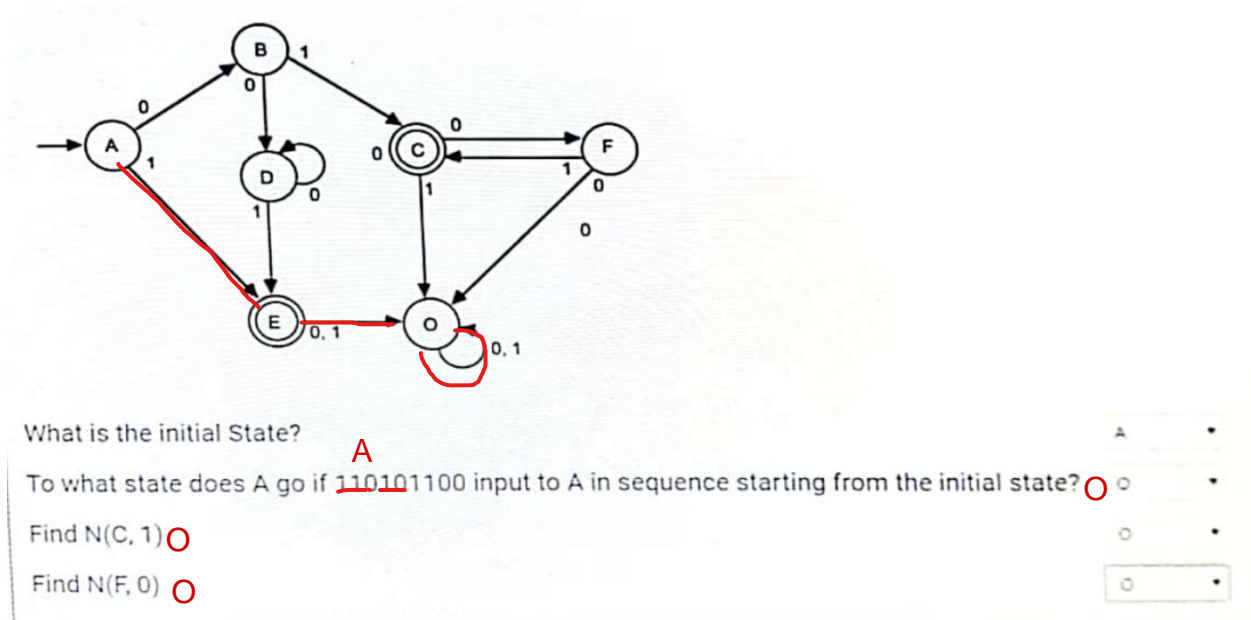
8) What is the value of x?
 $\text{Int } x = 50 \% 6 + 2 * 3 + (4 - 1) / 2 + 9$ **37/2**

9) Simplify the following Boolean expression

$$\overline{A(\overline{B}\overline{C} + BC)}$$

$$= A' + C'.B + CB'$$

10) Consider the following finite state machine A



11) If repetition is not allowed, then how many numbers between 2000 and 3000 can be formed using the digits from 0 to 7? $1 * 7 * 6 * 5 = 210$

12) In a cricket tournament there are 15 matches. If each team plays one match with every other team, the number of team is: $\frac{n(n-1)}{2} = 15$
 $n = 6$

13)

The function $f : \mathbb{Z} \rightarrow \mathbb{Z}$ defined by

$$f(n) = \begin{cases} \frac{n}{2} & \text{if } n \text{ is even} \\ \frac{n+1}{2} & \text{if } n \text{ is odd} \end{cases}$$

Is the function one to one ?

☒ Yes

☐ No

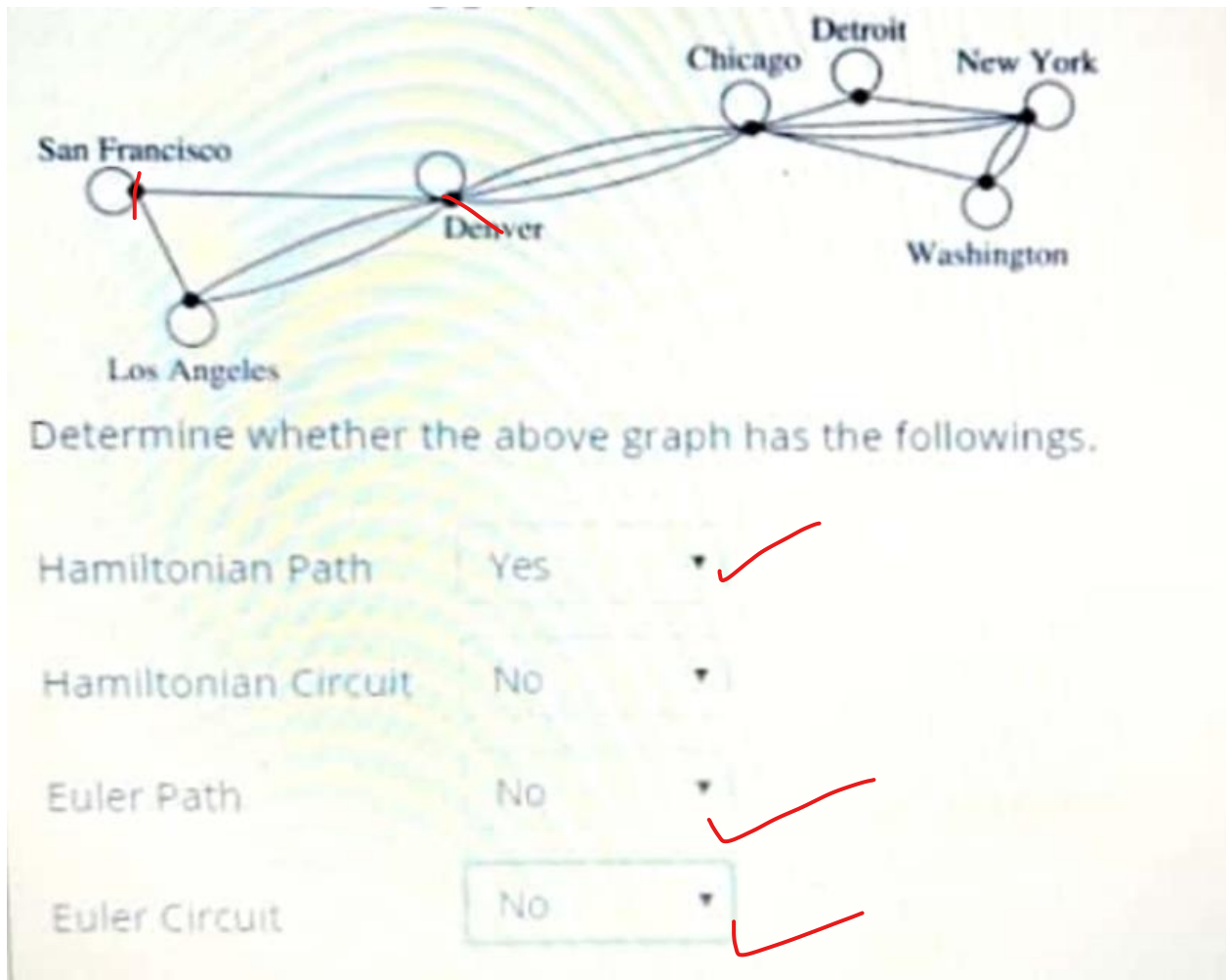
Is the function onto?

☐ No

☒ Yes

14) How many numbers not exceeding 10000 can be made using the digits 2,4,5,6,8 if repetition of digits is allowed? $5 + 25 + 125 + 625 = 780$

15) Consider the following graph



16)

$$f(x) = \frac{x^2 + 1}{5x - 3}$$

Find $f'(-1) = -3/32$
(Differentiate the function and substitute)

17) Consider the following function

$$g: \mathbb{R} \rightarrow \mathbb{R} \quad g(x) = \frac{(-2x + 1)}{3}$$

Find $g^{-1}(-3) = 5$

Hint : Find the inverse of g and substitute -3 .

18) Find the following definite integral

$$\int_2^4 |3x - 4| dx$$

(Please remove spaces from the answer)

19) If $|A| = 43$ then find the cofactor matrix of A

$$A = \begin{bmatrix} 1 & 2 & 7 \\ 4 & -3 & 0x \\ 2 & 2 & 5 \end{bmatrix}$$

$$43 = -15 + 4x + 56 - (-42 + 2x + 40)$$

$$43 = 43 + 2x$$

$$x = 0$$

$$C_{11} =$$

$$C_{12} =$$

$$C_{13} =$$

$$C_{14} =$$

$$C_{21} =$$

$$C_{22} =$$

$$C_{23} =$$

$$C_{31} =$$

$$C_{32} =$$

$$C_{33} =$$

20)

$$\begin{bmatrix} 1 & 0 & 0 & 1 & -1 & 2 \\ 2 & 1 & 0 & -1 & 2 & 1 \\ 0 & 0 & 3 & 6 & -3 & 18 \end{bmatrix}$$

↓

$$\begin{bmatrix} 1 & 0 & 0 & 1 & -1 & 2 \\ 0 & 1 & 0 & a & b & c \\ 0 & 0 & 1 & d & e & f \end{bmatrix}$$

$$r2' = r2 - r1 * 2$$

$$r3' = r3 / 3$$

$$\begin{aligned} a &= -3 \\ b &= 4 \\ c &= -3 \\ d &= 2 \\ e &= -1 \\ f &= 6 \end{aligned}$$

Find the values of a, b, c, d, e, f

21) $3x - 5y = 1$

$4x - 3y = 5$

Represent the above equation in $Ax = b$ form

$$A \cdot x = b$$

$$\begin{bmatrix} 3 & -5 \\ 4 & -3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 \\ 5 \end{bmatrix}$$

Let $\text{adj } A = \begin{bmatrix} p & q \\ r & s \end{bmatrix}$

$$A = \begin{bmatrix} 3 & -5 \\ 4 & -3 \end{bmatrix}$$

Find the following

$|A| = 11$

$$C = \begin{bmatrix} -3 & -4 \\ 5 & 3 \end{bmatrix}$$

$p = -3$

$q = 5$

$r = -4$

$s = 3$

$x = -2/11$

$y = 1$

$$C^T = \begin{bmatrix} -3 & 5 \\ -4 & 3 \end{bmatrix} = \text{adj } A$$

$$x = b * (A \text{ invers})$$

$$A \text{ invers} = \begin{bmatrix} -3/11 & 5/11 \\ -4/11 & 3/11 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -3/11 & 5/11 \\ -4/11 & 3/11 \end{bmatrix} \begin{bmatrix} 1 \\ 5 \end{bmatrix}$$

$$\begin{aligned} x &= -2/11 \\ y &= 1 \end{aligned}$$

22) Find the determinant of A

$$A = \begin{bmatrix} 2 & -3 & 5 \\ -3 & 6 & 2 \\ 1 & -2 & 5 \end{bmatrix}$$

$$\begin{aligned} \det A &= 60 - 6 + 30 - (30 - 8 + 45) \\ &= 84 - 67 \\ &= 17 \end{aligned}$$

23) Find the values of the resulting matrix

$$\begin{bmatrix} 1 & 0 & -1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 2 & 1 & -1 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$$

↓

$$\begin{aligned} r_2' &= r_2 - r_3 \\ r_1' &= r_1 + r_3 \end{aligned}$$

$$\begin{bmatrix} 1 & 0 & 0 & a & b & c \\ 0 & 1 & 0 & d & e & f \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$$

$$\begin{aligned} a &= 2 \\ b &= 1 \\ c &= 1 \\ d &= 1 \\ e &= 1 \\ f &= -2 \end{aligned}$$

$$\begin{bmatrix} 1 & 0 & 0 & 2 & 1 & 1 \\ 0 & 1 & 0 & 1 & 1 & -2 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$$

24)

$$A = \begin{bmatrix} 3 & 2 \\ 5 & 4 \end{bmatrix} \quad c = \begin{bmatrix} 4 & -5 \\ -2 & 3 \end{bmatrix} \quad c^T = \begin{bmatrix} 4 & -2 \\ -5 & 3 \end{bmatrix}$$

Find the determinant of the above matrix.:

$$\det A = 2$$

Find the inverse of the matrix A. $A^{-1} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$

$$a = : \text{ } 2$$

$$A \text{ invers} = \begin{bmatrix} 2 & -1 \\ -5/2 & 3/2 \end{bmatrix}$$

$$b = : \text{ } -1$$

$$c = : \text{ } -2.5$$

$$d = : \text{ } 1.5$$

(Write your answer with one decimal place)

25)

$$\text{Let } A = \begin{bmatrix} 1 & 2 \\ -5 & 4 \end{bmatrix} \text{ and } B = \begin{bmatrix} 3 & 0 \\ -1 & 7 \end{bmatrix}$$

Find $D = B^2 + AB - I$

$$D = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

$$B.B = \begin{bmatrix} 9 & 0 \\ -10 & 49 \end{bmatrix}$$

$$a = : \text{ } 9$$

$$AB = \begin{bmatrix} 1 & 14 \\ -19 & 28 \end{bmatrix}$$

$$b = : \text{ } 14$$

$$D = \begin{bmatrix} 9 & 14 \\ -29 & 77 \end{bmatrix}$$

$$c = : \text{ } -29$$

$$d = : \text{ } 77$$

