Suez Canal University

Faculty of Computers & Informatics

First Semester; First Level

Date: 20-11-2021; Time: **1.5- Hours**

Module (B) **Mid-Term Examination 2021-2020** **Module(B)**

Discrete Mathematics (BS-103)

First Question (10- Marks)

❶ **Choose the correct sign "✓ or ×" for the followings:**

[1]	$\neg[\forall x, P(x)] \equiv \exists x, \neg P(x)$	(..✓...)
[2]	If p is true and q is false, then $p \wedge \bar{q}$ is always true	(..✓...)
[3]	$\bigcap_{n=1}^{N} A_n = \{x \mid \forall n, x \in A_n\}$	(..✓...)
[4]	The function is onto, when every value in the range has at least one value in the domain that maps to it.	(..✓...)
[5]	If n is rational, then $(\forall n)(3n + 2 < n)$	(...✗...)
[6]	$\overline{p \rightarrow q} = p \wedge \bar{q}$	(..✓...)
[7]	If $R: X \rightarrow Y$ is a relation, then its inverse is $R^{-1}: Y \rightarrow X$	(..✓...)
[8]	$\bar{P} \wedge T \equiv P$	(...✗...)
[9]	The relation "greater than or equal" is reflexive	(..✓...)
[10]	Union between the relation R with its inverse makes R symmetric.	(..✓...)
[11]	R^{∞} is always transitive relation.	(..✓...)
[12]	If p is $5 \geq 2$ and q is "$3 \leq 2$" then $p \oplus q$ is false	(...✗...)
[13]	The vertical asymptote line for the function $f(x) = \frac{1}{x+1}$ is $y = -1$	(...✗...)
[14]	The relation $R \cup R^{-1}$ refers to reflexive closure.	(...✗...)
[15]	For the whole numbers greater than two, being odd is necessary to being prime.	(..✓...)

❷ **Choose the correct answer for the following statements:**

[1]	A number being divisible by 2 is ..... for its being even.	{ necessary , sufficient }
[2]	$\neg[\forall x, \bar{P}(x)] \equiv \cdots$.	$\{\exists x, \bar{P}(x); \exists x, P(x); \forall x, P(x)\}$
[3]	$A - \bar{B} = \cdots$	$\{A \cup B, A \cap B, B - A\}$
[4]	$A \oplus B = (A \cup B) - (A \cap B)$	{True, False}
[5]	$\forall x, y, z \in z^{+}$ Let $P(x, y, z): x + y + z$, then $p(x, x-1, x+1)$ equals	$\{x^3, 3x, x\}$

Solve behind the page if necessary.

Second Question (10- Marks)

❶ Use indirect proof to prove that if x^2 is odd, then x is odd. (solve behind this paper) $\boxed{4}$

● If $R: X \to X, X = \{1, 2, 3, 4\}$, $R = \left\{\begin{matrix}(1,1), (2,2), (3,3), (1,2), (1,3), (2,1), (2,3), \\ (3,1), (3,4), (4,2), (4,3)\end{matrix}\right\}$, find: $\boxed{6}$

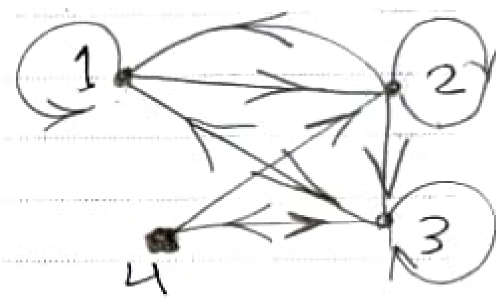
① X^2, ② R^{-1}, ③ $\bar{R}$, ④ the graph the relation,

⑤ the matrix of the relation relative to the ordering 1432,

⑥ and finally classify the relation if it is reflexive, symmetric, and transitive or not.

① $X^2 = \{(1,1), (1,2), (1,3), (1,4), (2,1), (2,2), (2,3), (2,4), (3,1), (3,2), (3,3), (3,4), (4,1), (4,2), (4,3), (4,4)\}$

② $R^{-1} = \{(1,1), (2,2), (3,3), (2,1), (3,1), (1,2), (3,2), (1,3), (4,3), (2,4), (3,4)\}$



③ $\overline{R} = X^2 - R = \{ - - -$

④ $A_R = \begin{array}{c|cccc} & 1 & 4 & 3 & 2 \\ \hline 1 & 1 & 0 & 1 & 1 \\ 4 & 0 & 0 & 1 & 1 \\ 3 & 1 & 0 & 1 & 1 \\ 2 & 1 & 0 & 1 & 1 \end{array}$

Third Question (10- Marks)

● If $S_n = \{n^2k^2 \mid k = 1, 2\}$, find $\bigcup_{n=2}^{3} S_n$. $\boxed{5}$

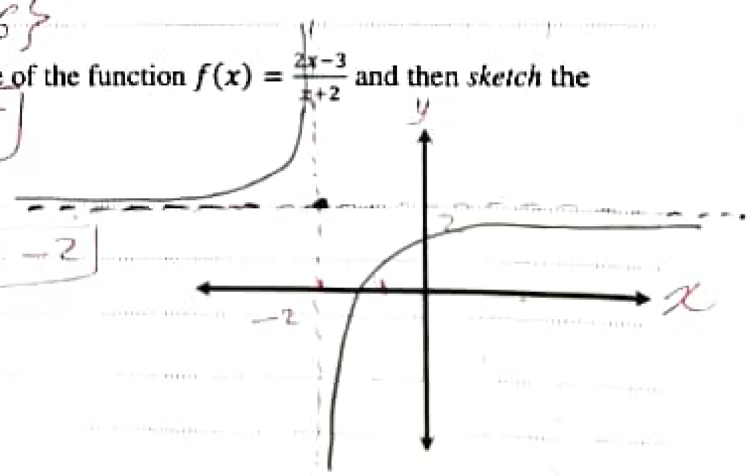
$\bigcup_{n=2}^{3} S_n = S_2 \cup S_3$

$S_2 = \{4k^2 \mid k = 1, 2\} = \{4, 16\}$

$S_3 = \{9k^2 \mid k = 1, 2\} = \{9, 36\}$

$\bigcup_{n=2}^{3} S_n = S_2 \cup S_3 = \{4, 16, 9, 36\}$

● Find the *horizontal* and the *vertical* asymptote of the function $f(x) = \frac{2x-3}{x+2}$ and then *sketch* the graph of the function. $\boxed{5}$



vertical asympotete

$x + 2 = 0 \longrightarrow \boxed{x = -2}$

horizontal asympotote

$y = \lim_{x \to \infty} \frac{2x-3}{x+2} = 2$

(انتهت الأسئلة)

Solve behind the page if necessary.

- If x^2 is odd, then x is odd ::

P: x^2 is odd $\longrightarrow \overline{P}$: x^2 is even

q: x is odd $\longrightarrow \overline{q}$: x is even.

let x is even $\longrightarrow x = 2K$, $K \geq 0$

$\Rightarrow x^2 = 4K^2 = 2(2K^2) = 2m$, $m \geq$

then x^2 is even., i.e., $\overline{q} \to \overline{P} \equiv P \to q$