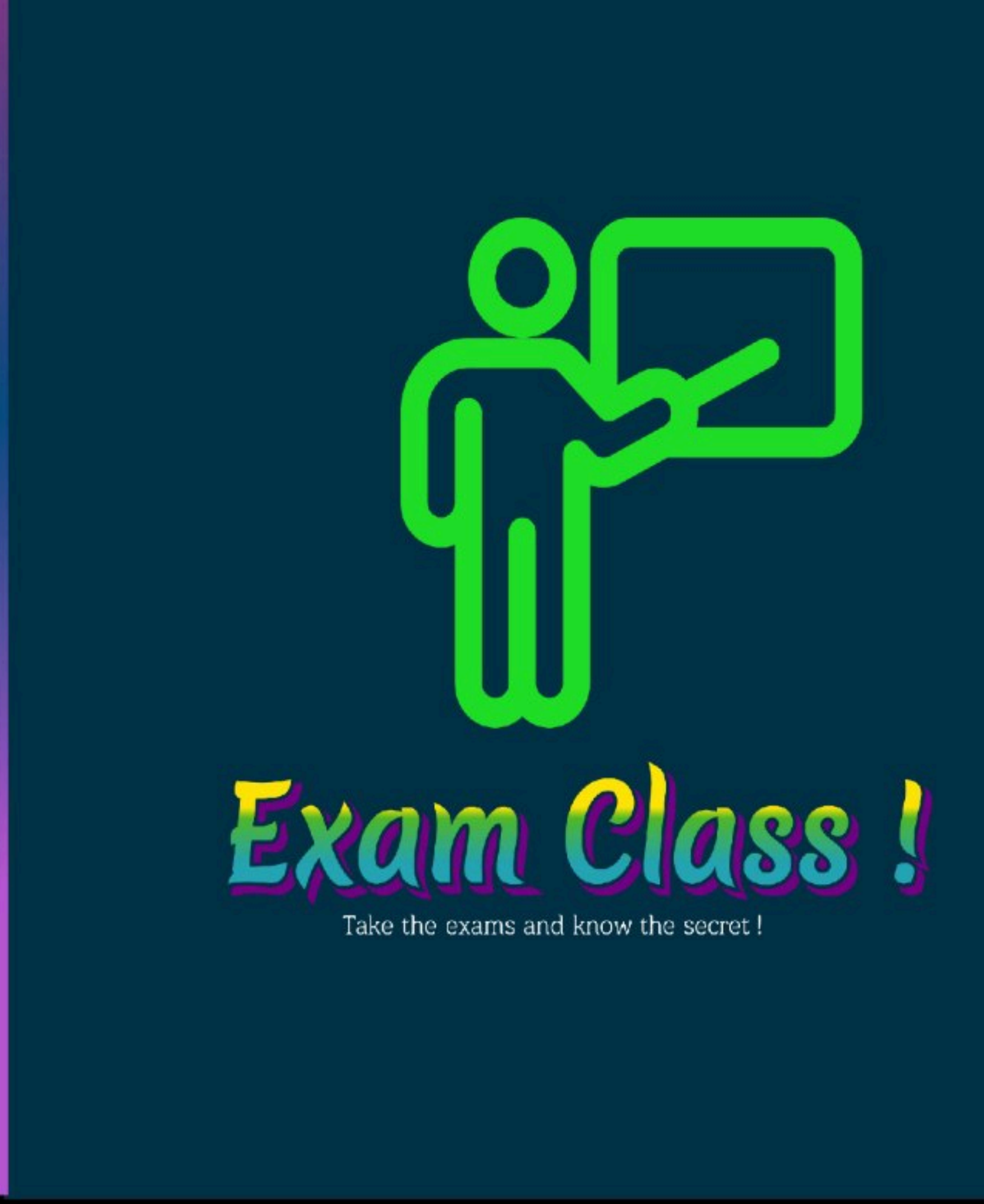




በ Exam Class ከ ቀለሜ ቻናል ጋር በመተባበር የተዘጋጀ !

ADDIS ABABA UNIVERSITY
COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES
DEPARTMENT OF MATHEMATICS
Mathematics for Social Sciences (Math 1012)
Final Examination - January 03, 2022

Name _____ Student ID. No. _____

Instructor/Section _____ Campus _____ Time allowed: 2 and 1/2 Hours

Instructions :

- This examination has four parts: **five (5)** true or false questions, **fifteen(15)** multiple choice questions, **five (5)** short answer questions and **five (4)** workout problems.
- The maximum points allocated for this exam is 50%.
- Any form of cheating results in cancellation of your total score in the exam.
- Your answer for each question should be written clearly and neatly in the space provided.
- Do not use pencils or red colored pens.
- Unreadable; ambiguous answers may not be corrected.
- Calculators and Mobile phones are strictly forbidden.

For Instructors' use only:

PART I (5%)	PART II (15%)	PART III (12%)	PART III (18%)	TOTAL (50%)

I. True of False Questions: Write "True" if the statement is correct or "False" if otherwise. (Each question worth 1pt.)

_____1. The product of matrices is not commutative.

_____2. If the two functions f and g have the same domain, then $f = g$.

_____3. The inverse of a function is not necessarily a function.

_____4. -1 is a zero of the function $r(x) = \frac{x+1}{x^2-1}$.

_____5. The equations $x + 2y = 1$ and $7x + 14y = 12$ are consistent.

II. **Multiple choice Questions:** Write your choice on the space provided to the left side of the question. (Each question worth 1 pts.)

_____1. For any three sets A, B and C, which of the following is **NOT** true?

A) $B - A \subseteq A^c$.
B) $\{A \subset B,\ B \subset C,\ C \subset A\} \Rightarrow A = C$.
C) $B - A^c = B \cap A$.
D) $A \subset B \Rightarrow B^c \subset A^c$.

_____2. If $A = \{a, \{a, b\}, \emptyset\}$, then which one of the following is **NOT** true?

A) $\{a, b\} \in A$ B) $\{\{a, b\}\} \subseteq A$ C) $\{a, b\} \subseteq A$ D) $\{\emptyset\} \subset A$

_____3. For any two propositions p and q, which of the following compound proposition is a tautology?

A) $p \to q$ B) $(q \to q) \Leftrightarrow \neg p$ C) $(p \Leftrightarrow \neg p) \to q$ D) $(p \wedge p) \Leftrightarrow q$

_____4. Which of the following has a truth value true?

A) $(\exists x \in \mathbb{R})(x^2 + 1 = 0)$ B) $(\forall x \in \mathbb{R})(x^2 - 1 \geq 0)$
C) $(\exists x \in \mathbb{N})(x + 2 = 0)$ D) $(\forall x \in \mathbb{R})(x^2 + 3 \geq 3)$

_____5. Which of the following is a **NOT** a correct identity?

A) $\cos x + \sin x \tan x = \sec x$
B) $\frac{\tan x}{\sec x - 1} = \frac{\sec x + 1}{\tan x}$.
C) $\frac{\sin x - \cos x}{\sin x} = 1 + \sec x$.
D) $\sec x - \cos x = \tan x \sin x$.

_____6. Let A be an $n \times n$ nonsingular matrix and k a nonzero real number. Which one of the follow statement about determinants is true?

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A) $\det(A^t) = \det(A)$.
B) $\det(A^t) = 1 \Rightarrow A = I_n$.
C) $\det(A^{-1}) = \det(A)$.
D) $\det(kA) = k \det(A)$.

_____7. If $1 \in A$ and $1 \notin B$, then which of the following is necessarily true?

A) $A \cap B = \emptyset$ B) $B \subseteq A$ C) $A \nsubseteq B$ D) $A \Delta B = \emptyset$

_____8. Let U denotes the universal set. If $U = \{1,2,3,\cdots,8\}$, $A = \{1,3,5,6\}$ and $B = \{2,4,6,8\}$, then which of the following is true?

A) $A \cup B = \{1,2,3,4,5,6,8,9\}$ B) $B' = \{1,3,5,7,9\}$

C) $A \Delta B = \{1,2,3,4,5,8\}$ D) $A' \cap B = \{6\}$

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_____9. Which one of the following sets is closed under addition?

A) The set of irrational numbers. B) The set of odd integers.

C) The set of even integers. D) All of the above

_____10. One real root of the equation $x^3 + x - 5 = 0$ lies in the interval?

A) $(1,2)$ B) $(2,3)$ C) $(-3,-2)$ D) $(3,4)$

_____11. Let A be 2×3 matrix, B be 2×5 matrix and C be 5×3 matrix. Which of the following matrix product is defined?

A) CB B) $B^t A$ C) AC D) BA^t

_____12. Which of the following is the inverse of the function $g(x) = x + 4$?

A) $g^{-1}(x) = x + 4$ B) $g^{-1}(x) = x - 4$ C) $g^{-1}(x) = 4 - x$ D) $g^{-1}(x) = \frac{x}{4}$

_____13. Which one of the following is in reduced row-echelon form?

A) $\begin{bmatrix} 1 & -3 & 2 \\ 0 & 0 & 1 \end{bmatrix}$ B) $\begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ C) $\begin{bmatrix} 1 & -3 & 0 \\ 0 & 1 & 0 \end{bmatrix}$ D) $\begin{bmatrix} 1 & 0 & 5 \\ 0 & 1 & 6 \end{bmatrix}$

_____14. If one of the zeros of $f(x) = x^3 + 3x^2 + bx - 5$ is -1, then the value of b equals?

A) 6 B) 3 C) -5 D) 5

_____15. Which of the following is NOT a factor of the polynomial function $f(x) = 2x^3 - 3x^2 - 18x + 27$?

A) $x + 3$ B) $x - 3$ C) $2x - 3$ D) $x + 1$

III. **Short answer Questions:** Write your simplified answer on the space provided. (Each blank space worth 1.5 pts.)

(1) In a class of 50 students, 30 students can speak English, 25 students can speak Arabic and 2 students speak neither.

i) The number of students who speak only English is _____

ii) The number of students who speak both languages is _____.

(2) Let $h(x) = 2x - 3$ and $g(x) = 5 - 4x$. Then

i) $(f - 2g)(1) =$ _____

ii) $(fog)(0) =$ _____.

iii) $(gof)(x) =$ _____

(3) The period of the function $f(x) = \sin x \cos x$ is _____.

(4) The adjoint of the matrix $A = \begin{bmatrix} 1 & 2 \\ 0 & 0 \end{bmatrix}$ is _____.

(5) Let $A = \begin{bmatrix} 1 & 2 \\ 2 & -3 \\ 0 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 & 0 \\ -3 & 4 & -4 \end{bmatrix}$. Then $A^t - 2B =$ _____.

IV. Workout problems: Show the necessary steps clearly.

(1) Use **only** the method of **truth table** to determine the validity of

$p \Rightarrow q, q \Rightarrow r \vdash (p \vee q) \Rightarrow r.$ (4 Pts.)

(2) Let $f(x) = 2x + 1$. Find $g(x)$ such that $f(g(x)) = 3x - 1$.

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(3) Consider the function $f(x) = \frac{x-3}{x^2-5x+6}$. Find

i) the domain and range of f.

ii) the intercepts and asymptotes of the graph of f.

iii) sketch the graph of f.

Answer

(12) III Short Answer

1) i. 23 student
ii) 7 students

2) i $(f-2g)(1) = -3$
ii $(fog)(0) = 7$
iii $(gof)(x) = 17 - 8x$

3)

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

5) $A^t - 2B = \begin{bmatrix} -1 & 6 & 0 \\ 8 & -11 & 4 \end{bmatrix}$

II multiple choice (15%)

1.
2. C $\{a,b\} \subseteq A$
3. C $(P \Rightarrow \neg P) \rightarrow q$
4. D $(\forall x \in R)(x^2+3 \geq 3)$
5. C
6. A
7. C
8. C
9. D
10. A
11. B
12 B
13 D
14 B
15 D

T/F(5)

1. False
2. False
3. True
4. True
5. True

	choice
1	D

IV) Work out (18)

1)

P	q	r	$P \Rightarrow q$	$P \vee q$	$q \Rightarrow r$	$(P \vee q) \Rightarrow r$
T	T	T	T	T	T	T
T	T	F	T	T	F	F
T	F	T	F	T	F	T
T	F	F	F	T	T	F
F	T	T	T	T	T	T
F	T	F	T	T	F	F
F	F	T	T	F	T	T
F	F	F	T	F	T	T

From table the given premises are True in row 1, 5, 7 and 8 ~~simultaneously~~ simultaneously. Since conclusion also true, it is valid!

2) $f(x) = 2x+1$ and $f(g(x)) = 3x-1$

Let $g(x) = ax+b$

$f(g(x)) = 3x-1$

$2(ax+b)+1 = 3x-1$

$2ax+2b+1 = 3x-1$

Thus both are linear functio

$2ax = 3x$
$2a = 3$
$a = 3/2$

$2b+1 = -1$
$2b = -2$
$b = -1$

$g(x) = 3/2 x - 1$

Werabe University
College of Natural and Computational Sciences
Department of Mathematics

Math1011: Final Exam for 1st Year social science students' regular program (50%)

Name _____ **ID N^{o}.** 00524 **Section** 5

General Instructions:

- ✓ Switch off your mobile Phone before you start to do the exam.
- ✓ Write your name, ID. No and section in the provided space.
- ✓ Any kind of cheating makes your result "F".
- ✓ Don't detach any paper from this exam sheet.
- ✓ Make sure that the examination paper contains 4 items and 24 questions.

I) Write true if the statement is correct and false if the statement is incorrect. (1. pts.)

1. _____. For any set A, $\emptyset$ is subset of $P(A)$.
2. _____. Every relation is a function.
3. _____.The set of irrational numbers is closed under addition.
4. _____. In relation $R = \{(1,2),(2,2),(1,3)\}$, 2 is related to 1.
5. _____.For two non-empty sets A and B, the inverse of $A \times B$ is $B \times A$.

II) Fill the blank space with the correct answer. (1 point each)

6. Let the universal set $U = \{1,2,3,4,5,6,7,8\}$, $A = \{1,2,3,4,5\}$ and $B = \{3,4,5,6\}$ then,
   i. $A \cup B =$ _____
   ii. $A \Delta B =$ _____
   iii. $(A \cup B)^c =$ _____
   iv. $(A - B)^c =$ _____

1 worabe final social maths

Let R be a relation on the set $A=\{1,2,3,4,5\}$ defined by $R=\{(x,y): x=y+1, x\in A, y\in A\}$

i. $R=$ _____

ii. $\text{Dom}(R)=$ _____

iii. $\text{Range}(R)=$ _____

iv. $R^{-1}=$ _____

v. $\text{Dom}(R^{-1})=$ _____

vi. $\text{Range}(R^{-1})=$ _____

III) Choose the correct answer for the following questions. (2 pts is each)

8. [redacted] If R is a relation on a set $A=\{1,2\}$, then which one of the following is identity relation.

A. $R=\{(1,1),(1,2),(2,1),(2,2)\}$
C. $R=\{(1,1),(2,2)\}$
B. $R=\{(2,1),(2,2)\}$
D. $R=\{(1,1),(1,2)\}$

9. [redacted] If R is universal relation on non-empty set A, then one of the following is wrong

A. $R\subseteq A\times A$ B. $R=A$ C. $A\times A\subseteq R$ D. $R=A\times A$

10. [redacted] Which one of the following is the variable expression of the "phrase twice a number decreased by 30" by using x as a number?

A. $x-60$
C. $2(x-30)$
B. $x+2-30$
D. $2x-30$

11. [redacted] Which one of the following is always correct if $a\leq b, \forall a,b\in R^+$

A. $a+4\leq b+4$
C. $a^2\leq a^2b$
B. $-a\leq -b$
D. $a^2\leq b^2$

12. [redacted] Given two linear inequalities $2x+5>2+3x$ and $2x-3\leq 4x-5$, then which one the following can be the value of x?

A. -2 B. 5 C. 2 D. -4

13. [redacted] Which one is the correct solution set for the inequality $x^2+6x-27<0$?

A. $(-3,9)$
C. $(-9,3)$
B. $(-\infty,-9)\cup(3,\infty)$
D. $(-\infty,-3)\cup(9,\infty)$

2 worabe final social maths

14. [redacted]The man sold his used computer and accessories for birr 352. If he received seven times as much money for the computer as he did for the accessories, then how much money he received for the computer?

A. Birr 55 B. Birr 308 C. Birr 2464 D. Birr 44

15. [redacted]If f is a function defined as $f = \{(2,4),(3,5),(3,y)\}$ then what is the value of y?

A. 4 B. 3 C. 2 D. 5

16. [redacted]Mr. Abebe solved an equation using steps shown below:

Given: $4x - 7 = 17$

step 1: $4x - 7 + 7 = 17 + 7$

step 2: $4x = 24$

step 3: $x = 6$, then which property justifies Abebes' computation in **step1**?

A. Additive identity property C. Additive inverse property

B. Commutative property D. substitution property

17. [redacted]Jamal correctly solved a linear equation and the last line of his computing work was $2 = 3$. Then which statement best describes the solution to the equation that Jamal was solving?

A. The solutions are both 2 and 3 C. The equation has no solution

B. The equation has unique solution D. The equation has infinitely many solution

18. [redacted]let set $A = \{x | x \text{ is a letter in the word "FOLLOW"}\}$

And set $B = \{y | y \text{ is a letter in the word "WOLF"}\}$.

Then which one of the following describes correctly the relation of set A and B?

A. $A \cap B = \phi$ B. $A \backslash B = A$ C. $A = B$ D. $A \neq B$

19. [redacted]Let $x = \frac{29}{83}$, then what is the multiplicative invers of $x + \frac{21}{83}$?

A. $\frac{29}{83}$ B. $\frac{83}{29}$ C. $\frac{50}{83}$ D. $\frac{83}{50}$

20. [redacted]Which one of the following is correct

A. The quadratic equation $3x^2 - 6x + 5 = 0$ has no real solution.

B. The quadratic equation $x^2 - 4x + 4 = 0$ has only one real solution

C. The quadratic equation $x^2 - 6x - 6 = 0$ has two real solution

D. The quadratic equation $(x-2)^2 - 5 = 0$ has no real solution

3 worabe final social maths

[redacted] If (1,3),(2,5) and (3,3) are three elements of $A \times B$ and the total number of elements in $A \times B$ is 6, then the remaining elements of $A \times B$ are

A. (1,5),(2,3),(3,5)
B. (1,5),(2,3),(5,3)
C. (5,1),(3,2),(5,3)
D. (1,5),(2,3),(3,5),(2,2)

IV. Show the necessary stapes in solving the following questions

22. Write the domain of $f(x)$ if; (2.5pt. each)

A. $f(x) = 1 - \frac{1}{1-\frac{1}{x+2}}$

B. $f(x) = \sqrt{\frac{3}{x-2} - 4}$

23. A truck carries a load of 50 boxes; some are 20 kg boxes and the rest are 25 kg boxes. If the total weight of all boxes is 1175 kg, how many of each type are there? (3pt.)

24. Solve each of the following (3pt. each)

A. $\frac{1}{x-5} + \frac{3}{x+2} = 4$

B. $x^2 - 2x - 1 < 0$

for any Set A,B
:. subset of P(A)

A

4 worabe final social maths