



AKENTEN APPIAH-MENKA UNIVERSITY OF SKILLS TRAINING
AND ENTREPRENEURIAL DEVELOPMENT
INSTITUTE FOR TEACHER PROFESSIONAL DEVELOPMENT AND
LIFELONG LEARNING (ITPDLL)
END OF FIRST SEMESTER EXAMINATION 2024/2025

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| COURSE CODE | EJM 232 |
| COURSE TITLE | LEARNING, TEACHING AND APPLYING FURTHER ALGEBRA |
| DURATION | TWO HOURS |

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SECTION A (20 MARKS)

Each of the questions below is followed by four options, lettered A, B, C, and D. Choose the option that best completes each statement and write the letter A, B, C, or D of the option you have chosen in your Answer Booklet.

- $(3 + \sqrt{3})$ is ...
 - an integer.
 - an irrational number.
 - a natural number.
 - a rational number
- If $x * y = x + y + 1$, what is $3 * (-4)$?
 - 0
 - 1
 - 2
 - 7
- An operation $@$ is defined by $i \boxtimes j = 4ij$, where i and j belong to the set of all real numbers. Find the identity element of the operation, \boxtimes .
 - $\frac{1}{2}$
 - $\frac{1}{3}$
 - $\frac{1}{4}$
 - $\frac{1}{5}$
- Solve $\log_{10} (5x + 2) - \log_{10} (x - 1) = 2$
 - $\frac{103}{95}$
 - $\frac{102}{95}$
 - $\frac{101}{95}$
 - $\frac{99}{95}$

5. The coefficient of a^8b^{10} in the expansion of $(a + b)^{18}$ is
- A). ${}^{18}C_8$
 - B). ${}^{18}P_8$
 - C). 2^{18}
 - D). ∞
6. If $g(x) = x^4 - 3x - 5$, evaluate $g(1)$?
- A. -8
 - B. -7
 - C. -2
 - D. 2
7. If $3^{a+b} = 3^{a-b} = \sqrt{27}$, then the value of b is
- A. 0
 - B. $\frac{1}{2}$
 - C. $\frac{3}{2}$
 - D. 2
8. Express $8a^2b^3(27a^4)(2^5ab)$ in the form $2^m3^n a^r b^s$
- A. $2^m3^n a^r b^s$
 - B. $2^33^3 a^7 b^3$
 - C. $2^83^2 a^7 b^4$
 - D. $2^83^3 a^7 b^4$
9. The coefficient of x^2 in the expansion of $(x + 3)(x - 2)(x + 1)$ is:
- A. 1
 - B. 2
 - C. 3
 - D. 4
10. Simplify $\frac{(2^3)(2^{-2})2^4}{2^{-1}(2^0)2^{-3}}$
- A. 2^9
 - B. 2^5
 - C. 2^{-5}
 - D. 2^{-9}

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11. Mrs. Ofori starts a job in a firm with an annual salary of Ghe14,400.00 which increases by Ghe1,800.00 every year for six years. Calculate Mrs. Ofori's total salary in the sixth year of service.

- A. Ghe151,400.00
- B. Ghe113,400.00
- C. Ghe143,400.00
- D. Ghe141,400.00

12. Find the n th term of the sequence -2, 4, 10, ...

- A. $U_n = 5n - 7$
- B. $U_n = 6n - 8$
- C. $U_n = 7n - 9$
- D. $U_n = 8n - 10$
- E.

13. If $M = \begin{bmatrix} 1 & 1 \\ -1 & 0 \\ 0 & -1 \end{bmatrix}$ and $N = \begin{bmatrix} 7 & 4 & 6 \\ 3 & 7 & 0 \\ -9 & -1 & 1 \end{bmatrix}$ then

- A). $M + N$ exists.
- B). MN exists.
- C). NM exists.
- D). $M - N$ exists.

14. Given the inequality $-12 < 15$ write the results when -10 is subtracted from both sides of the expression.

- A. $-2 < 5$
- B. $-22 < 3$
- C. $-22 < 25$
- D. $-2 < 25$

15. Solve the quadratic inequality $x^2 + 2x - 3 \leq 0$.

- A. $x \leq -1$ or $x \geq 3$
- B. $x \leq -1$ or $x \leq 3$
- C. $-1 \leq x \leq 3$
- D. $x \geq -1$ or $x \geq 3$

16. Which of the following is a polynomial?

- A). $x^2 - 5x + 4\sqrt{x} + 3$
- B). $x^{3/2} - x + x^{1/2} + 1$
- C). $\sqrt{x} + \frac{1}{\sqrt{x}}$
- D). $\sqrt{2}x^2 - 3\sqrt{3}x + \sqrt{6}$

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The sum of three times a first number and twice a second number is 43. If the second is subtracted from twice the first number, the result is -4 . Use this information to answer question 15 and 16

17. Use the given conditions to write a system of equations, (if the variable x represent the first number and y the second number)

A.
$$\begin{cases} 3x - y = 43 \\ y = 2x - 4 \end{cases}$$

B.
$$\begin{cases} 3x + 2y = 43 \\ 2x - y = -4 \end{cases}$$

C.
$$\begin{cases} 3x - 2y = 43 \\ y - 2x = -4 \end{cases}$$

D.
$$\begin{cases} 2x - 3y = 43 \\ 2y - x = -4 \end{cases}$$

18. Find the product of the two numbers

A. 5

B. 14

C. 19

D. 23

19. The sum and product of the zeros of a quadratic polynomial are 3 and -10 respectively.

The quadratic polynomial is

A). $x^2 - 3x + 10$

B). $x^2 + 3x - 10$

C). $x^2 - 3x - 10$

D). $x^2 + 3x + 10$

20. Find the inverse of the matrix $\begin{bmatrix} 4 & -1 \\ -7 & 2 \end{bmatrix}$

A. $\begin{bmatrix} 2 & 1 \\ 7 & 4 \end{bmatrix}$

B. $\begin{bmatrix} -4 & 1 \\ 7 & -2 \end{bmatrix}$

C. $\begin{bmatrix} 2 & 1 \\ 7 & 4 \end{bmatrix}$

D. $\begin{bmatrix} 2 & -7 \\ -1 & 4 \end{bmatrix}$

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SECTION B (5 MARKS)

This section contains statements. Write true or false for each of the following statements

21. The following expressions are either undefined or indeterminate $\frac{0}{0}, \frac{-5}{0}, \frac{0}{-5}$
22. $\log(X + Y) = \log Y + \log X$
23. Given that A is a matrix such that, $|A| = 0$ then A is invertible.
24. $\frac{1}{8}x + 8 = \sqrt{2}$ is a linear equation in one variable
25. $\left(\frac{3}{7}\right)^{-2} = \left(\frac{7}{2}\right)^3$

SECTION C (5 MARKS)

This section contains two columns, columns A and B. You are to match items in Column A with those in Column B.

For each of the following quadratic equations, indicate the type of roots(zeros): either equal real roots, distinct real roots or complex roots. (Hint: use the discriminant of the quadratic equation)

| A: Quadratic Equation (A) | B: Type of roots(zeros) |
|---------------------------|--|
| 26. $x^2 - 2x + 1 = 0$ | I. Equal Real Roots II. Distinct Real Roots III. Complex Roots |
| 27. $x^2 + 2x + 1 = 0$ | |
| 28. $x^2 + 2x + 2 = 0$ | |
| 29. $x^2 - 2x - 2 = 0$ | |
| 30. $x^2 + 2x - 2 = 0$ | |

SECTION D (10 MARKS)

Provide short answers to the following questions

31. Consider the operation, \odot , defined on the set of real numbers by $x \odot y = \frac{x+y}{xy}$

Evaluate $6\Delta(-2)$

32. Write down the first three terms of $(1 - 3x)^5$ using the binomial expansion.

33. Find the roots of the equation $x^2 - 3x + 2 = 0$

34. Given the polynomial $h(x) = 3x^4 + x^3 - 11x^2 - 9x + 18$, evaluate $h(-1)$

35. Simplify $\frac{2}{3}\log 8 + \frac{1}{2}\log 9 - \log 6$

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SECTION E (20 MARKS)

Please answer only one question from this section

36.

- a) Solve for the value of x in the equation: $\log_2(x-3) + \log_2(x-1) = 3$. (5 marks)
- b) Solve the inequality $8(x+1) + 1 < 3(2x) + 1$;
Give your answer in interval notation and indicate the answer geometrically on the real number line. (5Marks)
- c) The 7th term of an AP is 8 and the 4th term is 20. Find the first term and the common difference. (5Marks)
- d) The first three terms of a geometric sequence are 4, 12, 36. Find the sum of the first 6 terms (5marks)

37.

a). Let $M = \begin{bmatrix} 1 & 2 \\ 0 & -1 \\ 7 & 0 \end{bmatrix}$ $N = \begin{bmatrix} 1 & 3 \\ 4 & -1 \end{bmatrix}$ and $P = \begin{bmatrix} 1 & 2 & -1 \\ 1 & 0 & 2 \end{bmatrix}$

Compute the indicated matrices, if possible

i. $3M + P^T$ (5Marks)

ii. $N \times P$ (5Marks)

b). Using the Cramer's rule, solve the system of equations $\begin{cases} 2x + y = 9 \\ x - 3y = -13 \end{cases}$ (10 marks)

38.

3a. Find the value(s) of k for which the quadratic function $x^2 - kx + \frac{9}{4} = 0$ has equal roots. (7 marks)

3b. $(x-2)$ is a factor of the polynomial $f(x) = x^3 + ax^2 + 11x + b$, where a and b are constants. The remainder when divided by $(x+1)$ is -24 .

- i) Find the values of the constants a and b . (7 marks)
- ii) Factorize $f(x)$ completely. (6 marks)

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