

2024 SHS2 END OF SEMESTER EXAMS – MATHEMATICS [ELECTIVE] 1

ELECTIVE MATHEMATICS

PAPER 1

OBJECTIVE TEST (40 MARKS)

Time: 2 hours

Answer **all** questions

- The first three terms of the binomial expansion of $(1 + 3x)^6$ is given by $1 + 18x + 135x^2$. From this information, what is the value of $(0.97)^6$, correct to three decimal places.
A. 1.194 B. 0.834 C. 0.833 D. 0.582
- For what values of n will $a^2 + n = 3an - 1 - 2a$ have repeated roots?
A. $n = 0, n = 1\frac{7}{9}$ B. $n = 0, n = 4$ C. $n = 0, n = -1\frac{1}{2}$ D. $n = 0, n = -1\frac{7}{4}$
- Given that $f(x) = mx^2 + nx$, $f(1) = 5$ and $f(-1) = -1$, find the values of m and n .
A. $m = -3, n = -2$ B. $m = -2, n = 3$ C. $m = 2, n = 3$ D. $m = 3, n = 2$
- If $(x - 1)$ and $(x + 2)$ are factors of $x^3 - 2x^2 - 5x + 6$, find the third factor.
A. $(x + 3)$ B. $(x + 2)$ C. $(x - 2)$ D. $(x - 3)$
- Find the value of x for which $6(\sqrt{4x^2 + 1}) = 13x$ where $x > 0$.
A. $\frac{5}{6}$ B. $\frac{6}{5}$ C. $\frac{24}{25}$ D. $\frac{25}{24}$
- If $(x - A)^2 + B \equiv x^2 - 10x + 29$, find the value of $(A + B)$
A. -9 B. -1 C. 8 D. 9
- Given that $(x + 3y)$ is a factor of $x^2 - 2xy + py^2$, find the value of constant p
A. -15 B. -5 C. 1 D. 12
- For what values of q is $9x^2 + qx + 4$ a perfect square? A. ± 12 B. $\pm 6\sqrt{2}$ C. ± 6 D. $\pm 2\sqrt{3}$
- The roots of the equation $2x^2 - 5x - 3 = 0$ are α and β . Find the value of $\alpha^2 + \beta^2 - \alpha^2\beta^2$.
A. $\frac{11}{2}$ B. 7 C. $\frac{37}{4}$ D. 19
- Find the set of zeros of the polynomial $p(x) = x^3 - 2x^2 - x + 2$.
A. $\{0, 2, 3\}$ B. $\{-1, 0, 1\}$ C. $\{-2, 1, -1\}$ D. $\{-1, 1, 2\}$
- Given that $9^{2x-1} = 243\sqrt{3}$, find the value of x . A. 7 B. $\frac{7}{2}$ C. $\frac{8}{7}$ D. $\frac{7}{8}$
- Given that $\log_{10} x = a$ and $\log_{10} y = b$, express $\log_{10} \frac{10x^2}{\sqrt{y}}$ in terms of a and b .
A. $3a + \frac{1}{2}b + 1$ B. $3a - \frac{1}{2}b - 1$ C. $3a - \frac{1}{2}b + 1$ D. $3b - \frac{1}{2}a + 1$
- The fifth term in ascending order, in the binomial expansion of $(2x - 1)^6$ is
A. $-192x^5$ B. $-160x^8$ C. $60x^2$ D. $240x^4$
- If α and β are the roots of $2x^2 - 5x + n = 0$ such that $\alpha\beta = 2$, find the value of n .
A. -4 B. 4 C. -2 D. 2

15. When $f(x)$ is divided by $3x + 1$, the quotient is $x^2 - x + 3$ and the remainder is 2, find $f(x)$
- A. $3x^3 + 4x^2 + 8x + 1$ B. $3x^3 - 2x^2 - 8x + 3$
 C. $3x^3 - 2x^2 + 8x + 5$ D. $3x^3 - 4x^2 - 8x - 3$
16. Which of the following points does not satisfy $3x - y \geq 1$?
- A. (2, 1) B. (1, 2) C. (-1, 1) D. (1, -1)
17. If $x = \frac{1}{2}$ and $y = \frac{1}{3}$, find the value of the third term in the expansion of $(2x + 3y)^8$ in ascending powers of x .
- A. 16 B. 28 C. 84 D. 140
18. If $5 - \frac{\log(2n+1)^{\left(\frac{1}{3}n+1\right)}}{\log(2n+1)^2} = 0$, find the value of n .
- A. 2 B. 27 C. 29 D. 36
19. Given that $((3x + 1)(x^2 - 2x + 3) = 3x^3 - 5x^2 + qx + 3$, where q is a constant. Find the value of q .
- A. 7 B. 9 C. -7 D. -2
20. Find the set of zeros of the polynomial $p(x) = x^3 - 2x^2 - x + 2$
- A. $\{0, 1, 2\}$ B. $\{-1, 0, 1\}$ C. $\{-2, 1, -1\}$ D. $\{-2, 1, -1\}$
21. If $\frac{6x+k}{2x^2+7x-15} \equiv \frac{4}{x+5} - \frac{2}{2x-3}$, find the value of k .
- A. -25 B. -24 C. -22 D. -21
- α and β are roots of the equation $2x^2 - 3x + 4 = 0$. Use this information to answer questions 22 and 23
22. Find $(\alpha + \beta)$.
- A. 2 B. $\frac{3}{2}$ C. $-\frac{3}{2}$ D. -2
23. Find $\left(\frac{\alpha}{\beta} + \frac{\beta}{\alpha}\right)$.
- A. $-\frac{9}{8}$ B. $-\frac{7}{8}$ C. $\frac{7}{8}$ D. $\frac{9}{8}$
24. If $\log_{10} 5 = 0.699$ and $\log_{10} 3 = 0.477$, evaluate, correct to 3 significant figures, $\log_3 5$.
- A. 4.31 B. 3.32 C. 2.82 D. 1.47
25. If $(x + 1)$ is a factor of the polynomial $f(x) = x^3 - 4x^2 + x + 6$, find the remaining factors.
- A. $(x + 2)(x + 3)$ B. $(x - 2)(x + 3)$ C. $(x - 3)(x + 3)$ D. $(x - 3)(x - 2)$
26. If the binomial expansion of $(1 + 3x)^6$ is used to evaluate $(0.97)^6$, find the value of x .
- A. -0.03 B. -0.01 C. 0.01 D. 0.03
27. Which of the following is not a rational number?
- A. 0 B. $\frac{1}{3}$ C. $\sqrt{3}$ D. 3
28. Find the minimum value of $y = x^2 + 6x - 12$.
- A. -21 B. -12 C. -6 D. -3
29. If the sum of the roots of $2x^2 - 5mx + n = 0$ is 5, find the value of m
- A. 2 B. 2.5 C. -2.5 D. -2
30. Determine the equation of the axis of symmetry of the curve $y = x^2 + 6x - 12$.
- A. $y = 2x + 6$ B. $x = -6$ C. $x = -3$ D. $y = 6x - 12$
31. Solve $x^2 - 3x^2 + 3x - 1 = 0$.
- A. $x = 1, 1, 1$ B. $x = -1, 1, 1$ C. $x = -1, -1, 1$ D. $x = -1, 1 - 1, -1$

32. If $(2t + 3s)(t - s) = 0$ find the value of $\frac{t}{s}$

- A. $-\frac{3}{2}$ or 1 B. $-\frac{3}{2}$ or 1 C. $\frac{3}{2}$ or -1 D. $\frac{3}{2}$ or 1

33. If α and β are the roots of the equation $2x^2 - x - 2 = 0$, evaluate $(\alpha^2 + \beta^2)$.

- A. $-3\frac{3}{4}$ B. $-1\frac{3}{4}$ C. $2\frac{1}{4}$ D. $4\frac{1}{4}$

34. Given that $\log_{10} P = 2$ and $\log_p 5 = r$, find the value of r .

- A. 1 B. 2.5 C. $\frac{\log 5}{\log 2}$ D. $\frac{1}{2}\log_{10} 5$

35. Resolve $\frac{3x-1}{(x-2)^2}$, $x \neq 2$ into partial fraction.

- A. $\frac{3}{(x-2)} - \frac{7}{(x-2)^2}$ B. $\frac{3}{(x-2)^2} - \frac{7}{(x-2)}$ C. $\frac{3}{(x-2)} + \frac{5}{(x-2)^2}$ D. $\frac{3}{(x-2)^2} + \frac{5}{(x-2)}$

36. $f(x) = 3x^3 + 8x^2 + 6x + k$. If $f(2) = 1$, find k .

- A. -67 B. -61 C. 61 D. 67

37. Solve $5^x + 5^y = 150$ and $x - y = 1$ simultaneously.

- A. $x = 4, y = 3$ B. $x = 3, y = 4$ C. $x = 3, y = 2$ D. $x = 2, y = 3$

38. If α and β are the roots of $x^2 + x - 2 = 0$, find the value of $(\frac{1}{\alpha^2} + \frac{1}{\beta^2})$.

- A. $-\frac{3}{4}$ B. $\frac{1}{4}$ C. $\frac{3}{4}$ D. $\frac{5}{4}$

39. What is the coefficient of x^3y^2 in the binomial expansion of $(x + 2y)^5$?

- A. 80 B. 60 C. 50 D. 40

40. Given that $f: x \rightarrow x^4 - 3x^2 - 7x + 11$, find $f(-1)$

- A. 2 B. 8 C. 14 D. 16