KITH AND KIN INTERNATIONAL COLLEGE

7/11 Kaoli Olusanya Street, Owode Ibeshe, Ikorodu, Lagos State.

FIRST TERM EXAMINATION 2025/2026 ACADEMIC SESSION

NAME					
SUBJECT	FURTHER MATHEMATICS	CLASS	SS 2	DURATION	2 HOUR

(70 Marks)

INSTRUCTIONS

1. **Write your name in the space provided at the top of this question.**
2. **This paper is divided into two Parts: I and II.**
3. **Answer 10 questions; all in Part I, and 3 questions from Part II.**

PART A (40 Marks)

Attempt **all** questions in this part.

1. The polynomial $f(x) = 2x^3 + px^2 + qx - 5$ **has** $(x-1)$ as a factor and a remainder of **27** when divided by $(x+2)$, where p and q are constants. Find the values of p and q. **WAEC 2021/1 (5 Marks)**

2. (a) If $(x+2)$ and $(x-1)$ are factors of $(x) = 6x^4 + mx^3 - 13x^2 + nx + 14$ **,** find the;
   (i) values of m and n;
   (ii) remainder when $f(x)$ is divided by $(x+1)$ **WAEC 2006/3 (5 Marks)**

3. The roots of the equation $x^2 + mx + 11 = 0$ are α and β, where m is a constant.
   If $\alpha^2 + \beta^2 = 27$, find the values of m. **WAEC 2007/9 (5 Marks)**

4. Find the value of the constant k for which the equation: $2x^2 + (k+3)x + 2k = 0$ has equal roots. **WAEC 2004/3 (5 Marks)**

5. Prove by mathematical induction that: $1 + 4 + 7 \ldots (3n-2) = \frac{n}{2}(3n-1)$ **NECO 2007/4 (5 Marks)**

6. If $\sin A = \frac{3}{5}$ and $\cos B = \frac{15}{17}$, where A is an obtuse and B is acute, find the value of $\cos(A + B)$ **WAEC 2008/6 (5 Marks)**

7. Prove that $(1 + tan\theta)^2 + (1 - tan\theta)^2 = 2sec^2\theta$ **WAEC 2012/16a (5 marks)**

8. If p and q are two propositions, use the truth table technique to show that; $\sim(p \Leftrightarrow q) \equiv p \Leftrightarrow \sim q$ ***WAEC* 2007/8 (5 marks)**

PART II (30 Marks)

Attempt three [3] questions only in this part.

9. Given that the equation: $4(y-2)^2 = k(y-1)$ where k is a constant;
   (a) show that the sum of the roots equals their product.
   (b) find the values of k for which the difference between the roots is $3\frac{3}{4}$ **NECO 2016/10 (10 Marks)**

10. The remainder when the polynomial $f(x) = 2x^3 + px^2 + qx + 18$ is divided by $(x-1)$ is **10**. When it is divided by $x+1$ the remainder is **12**.
    (a) Find:
    (i) the values of the constants p and q;
    (ii) the zeros of $f(x)$
    (b) Hence or otherwise, sketch the graph of $f(x)$

WAEC 2006/10 (10 Marks)

11. (a) Copy and complete the following table of values for $\boldsymbol{y = 3sin2\theta - cos\theta}$

θ	0°	30°	60°	90°	120°	150°	180°
y	-1.0	0		0			1.0

(b) Using a scale of 2cm to 30° on the $\theta - axis$ and 2cm to 1 unit on the y −axis, draw the graph of $\boldsymbol{y = 3sin2\theta - cos\theta}$ for $\boldsymbol{0° \leq \theta \leq 180°}$.

(c) Use your graph to find the;

(i) solution of the equation $\boldsymbol{3sin2\theta - cos\theta = 0}$

(ii) maximum value of y correct to one decimal place. **WAEC 2015/13 (10 marks)**

12. (a) One of the roots of the cubic equation $\boldsymbol{x^3 + 2x^2 - 19x - 20 = 0}$ is **4**. Find the sum and the product of the other roots.

(b) Find the maximum and minimum points of the curve $\boldsymbol{y = 2x^3 - 3x^2 - 12x + 4}$.

(c) Sketch the curve in (b) above. **WAEC 2013/12 (10 marks)**

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NAME					
SUBJECT	FUTHER MATHEMATICS	CLASS	SS 2	DURATION	1 ½ HOUR

OBJECTIVE TEST
(40 marks)

Answer all questions: ***Each*** question is followed by ***four*** options lettered A to D. Find out the correct option for ***each*** question and ***shade in pencil*** on your answer space which bears the same letter as the option you have chosen. Give only ***one*** answer to ***each*** question.

1. The roots of the equation $2x^2 + kx + 5 = 0$ are α and β, where k is a constant. If $\alpha^2 + \beta^2 = -1$, find the values of k.
   A. ± 16
   B. ± 8
   C. ± 4
   D. ± 2

2. The polynomial 2 x^3 + x^2 - 3x + p has a remainder 20 when divided by (x - 2).Find the value of the constant p.
   A. 8
   B. 6
   C. -6
   D. -8

3. If $Px^2 + (P+1)x + P$ has equal roots, find the value of P.
   A. -1 and $-\frac{1}{3}$
   B. -1 and $\frac{1}{3}$
   C. 1 and $-\frac{1}{3}$
   D. 1 and $\frac{1}{3}$

4. If (x - 3) is a factor of 2x2 – 2x + p, find the value of constant p
   A. -12
   B. - 6
   C. 3
   D. 6

5. A polynomial is defined by P(x + 1) = x^2 + 3x - 4x + 2, find find P(2)
   A. -8
   B. -2
   C. 2
   D. 8

6. The remainder when $x^3 - 2x + m$ is divided by $x - 1$ is equal to the remainder when $2x^3 + x - m$ is divided by $2x + 1$. Find the value of m.
   A. $-\frac{7}{8}$
   B. $-\frac{3}{8}$
   C. $\frac{1}{8}$
   D. $\frac{5}{8}$

7. Factorize completely $x^2 + x^2y + 3x - 10y + 3xy - 10$
   A. $(x+2)(x+5)(y+1)$
   B. $(x+2)(x-5)(y+1)$
   C. $(x-2)(x+5)(y+1)$
   D. $(x-2)(x-5)(y+1)$

8. Simplify $(1 - \sin\theta)(1 + sin\theta)$
   A. $sin^2\theta$
   B. $sec^2\theta$
   C. $tan^2\theta$
   D. $cos^2\theta$

9. If sin x = -sin 70°, 0° < x<360°, determine the two possible values of x.
   A. 110°, 250°
   B. 250°,290°
   C. 110°,290°

D.200°,250°

10. If $Px^2 + (P+1)x + P$ has equal roots, find the value of P.
A. -1 and $-\frac{1}{3}$
B. -1 and $\frac{1}{3}$
C. 1 and $-\frac{1}{3}$
D. 1 and $\frac{1}{3}$s

11. Which of the following of the following is a factor of the polynomial $6x^4 + 2x^3 + 15x + 5$?
A. $3x + 1$
B. $x + 1$
C. $2x + 1$
D. $x + 2$

α and β are the roots of the equation $2x^2 - 3x + 4 = 0$. Use this information to answer questions 12 and13.

12. Find $(\alpha + \beta)$
A. -2
B. $-\frac{3}{2}$
C. $\frac{3}{2}$
D. 2

13. Find $\left(\frac{\alpha}{\beta} + \frac{\beta}{\alpha}\right)$
A. $-\frac{9}{8}$
B. $-\frac{7}{8}$
C. $\frac{7}{8}$
D. $\frac{9}{8}$

14. Find the minimum value of $y = x^2 + 6x - 12$
A. -21
B. -12
C. -6
D. -3

15. If $f(x) = 3x^3 + 8x^2 + 6x + k$, and $f(2) = 1$, find the value of k.
A. -67
B. -61
C. 61
D. 67

16. If the solution set of $x^2 + kx - 5 = 0$ is $(-1, 5)$, find the value of k.
A. -6
B. -4
C. 4
D. 5

17. The remainder when $x^3 - 2x + m$ is divided by $x - 1$ is equal to the remainder when $2x^3 + x - m$ is divided by $2x + 1$. Find the value of m.
A. $-\frac{7}{8}$
B. $-\frac{1}{8}$
C. $\frac{1}{8}$
D. $\frac{5}{8}$

18. Find the maximum value of $2\sin(\theta + 25°)$
A. 1
B. 2
C. 3
D. 4

19. if $\sin x = \frac{3}{5}$ and $\cos y = \frac{24}{25}$ where x and y are acute. Find the value of $cos(X + Y)$
A. $\frac{117}{125}$
B. $\frac{24}{25}$
C. $\frac{3}{25}$
D. $\frac{7}{25}$

20. Evaluate $\frac{1}{1-\sin 60°}$ leaving your answer in surd form.
A. $1 - \sqrt{3}$
B. $3 - \sqrt{3}$
C. $4 - 2\sqrt{3}$
D. $4 + 2\sqrt{3}$

21. Given that $\sin x = \frac{4}{5}$ and $\cos y = \frac{12}{13}$, where x is an obtuse angle and y is

an acute angle, find the value of $sin(x-y)$

A. $\frac{16}{65}$

B. $\frac{48}{65}$

C. $\frac{56}{65}$

D. $\frac{63}{65}$

22. Find the range of values of x for which
$2x^2+7x-15 \geq 0$
A. $x \geq -5$ or $x \leq \frac{3}{2}$
B. $x \leq -5$ or $x \geq \frac{3}{2}$
C. $-5 \leq x \leq \frac{3}{2}$
D. $-\frac{3}{2} \leq x \leq 5$

23. A straight line parallel to $2x+3y=6$ passes through the point $(-1,2)$. Find the equation of the line.
A. $2x-3y=2$
B. $2x+3y=-2$
C. $2x+3y=-4$
D. $2x+3y=4$

24. Rationalize $\frac{1}{\sqrt{2}+1}$
A. $\sqrt{2}-1$
B. $1-\sqrt{2}$
C. $\frac{\sqrt{2}-1}{2}$
D. $\frac{1-\sqrt{2}}{2}$

25. The sum and product of the roots of a quadratic equation are $\frac{4}{7}$ and $\frac{5}{7}$ respectively. Find its equation.
A. $7x^2-4x-5=0$
B. $7x^2-4x+5=0$
C. $7x^2+4x-5=0$
D. $7x^2+4x+5=0$

26. If α and β are the roots of the equation $2x^2-5x+6=0$, find the equation whose roots are $(\alpha+1)$ and $(\beta+1)$
A. $2x^2+9x+15$
B. $2x^2-9x+13$
C. $2x^2-9x-13$
D. $2x^2-9x-15$

27. Given that $f(x)=3x^2-12x+12$ and $f(x)=3$, find the values of x
A. $1, 3$
B. $-1,-3$
C. $1,-3$
D. $-1, 3$

28. Express $\frac{1}{1-\sin^{\circ}}$ in surd form.
A. $2+\sqrt{2}$
B. $2+\sqrt{3}$
C. $2-\sqrt{2}$
D. $1+\sqrt{2}$

29. Which of the following quadratic curves will not intersect with the x-axis?
A. $y=2-4x-x^2$
B. $y=x^2-5x-1$
C. $y=2x^2-x-1$
D. $y=3x^2-2x+4$

30. A rectangle has a perimeter of $24m$.If its area is to be a maximum, find its dimension.
A. 12,12
B. 6, 6
C. 4, 8
D. 9, 3

31. Simplify $\frac{\tan 80^{\circ}-\tan 20^{\circ}}{1+\tan 80^{\circ}\, tan 20^{\circ}}$
A. $3\sqrt{2}$
B. $2\sqrt{3}$
C. $\sqrt{3}$
D. $\sqrt{2}$

32. Given that α and β are the roots of an equation such that $\alpha + \beta = 3$ and $\alpha\beta = 2$, find the equation

A. x^2 - 3x - 2 = 0
B. x^2 – 2x +3 = 0
C. x^2 - 3x + 2 = 0
D. x^2 - 2x - 3 = 0

33. Find the equation of the line passing through $(0 - 1)$ and parallel to the y-axis.
A. $y = -1$
B. $y = 0$
C. $x = 0$
D. $x = -1$

34. The equation of the line of best fit for variables x and y is $y = 19.33 + 0.42x$, where x is the independent variable. Estimate the value of y when $x = 15$.
A. 18.91
B. 19.74
C. 25.63
D. 38.23

35. The parallelogram PQRS has vertices P$(-2, 3)$, Q$(1, 4)$, R$(2, 6)$ and S$(-1, 5)$. Find the coordinates of the point of intersection of the diagonals.
A. $(-1, 5)$
B. $\left(-\frac{1}{2}, 3\frac{1}{2}\right)$
C. $\left(0, 4\frac{1}{2}\right)$
D. $\left(1\frac{1}{2}, 5\right)$

36. Find the least value of the function $f(x) = 3x^2 + 18x + 32$
A. 5
B. 4
C. 3
D. 2

37. Which of the following is a **tautology**?
A. All men are women.
B. Either it rains or it doesn't rain.
C. Some men are bachelors.
D. No woman is married.

38. Consider the statement;
p: Tunde is short.
q: Tunde is brilliant.
Which of the following represents? the statement "Tunde is short but not brilliant"?
A. $p \vee q$
B. $p \vee \backsim q$
C. $p \wedge \backsim q$
D. $p \wedge q$

39. p and q are statements such that $p \Rightarrow q$
Which of the following is a valid? conclusion from the implication.
A. $q \Rightarrow p$
B. $\backsim q \Rightarrow p$
C. $\backsim q \Rightarrow \backsim p$
D. $q \Rightarrow \backsim p$

40. a: The school bus arrived late
b: The students walked down to school.
Which of the following can be represented by $b \Rightarrow a$?
A. Emmanuella did not go to school because the school bus arrived late.
B. The school bus arrived early and Kate ran to school.
C. Mary walked to school because the school bus arrived late.
D. Either the school bus arrived late or Maryam walked to school.