CHRIST HIGH SCHOOL PLOT 5, CHS STREET, KM 32, ABUJA-KEFFI

SECOND TERM EXAMINATION 2024/2025 ACADEMIC SESSION

SUBJECT: FURTHER MATHEMATICS (PAPER II)
CLASS: SS 2
TIME: 3HOURS

NAME……………………………

CANDIDATE'S ADMISSION NO.

INSTRUCTION

Write your name and number in the space provided on your answer booklet. Write your name on any extra sheet used.

At the end of the examination, staple all your work securely together.

PAPER I

PART I: ANSWER ALL QUESTIONS IN THIS PART. (8 Marks Each)

1a. Given that $P = 7i + 2j + k \ and \ Q = 3i - 2j + 4k$, find :

    i. $\boldsymbol{P \times Q}$

    ii. $|\boldsymbol{P \times Q}|$

    iii.   The unit vector perpendicular to both $P \ and \ Q$.

b. Evaluate $\lim\limits_{x \to \infty} \dfrac{x^2+5x+9}{2x^2-3x+15}$.

2a. Find the equation of the tangent to the curve

$$y = x^3 - 3x^2 + 6x + 15 \text{ at the point x=1}$$

2b. investigate the continuity of $p(x) = 4x^3 + 3x^2 - x \ at \ x = -1$

3a. Write down the binomial expansion of $(1 + x)^5$, simplifying all terms.

3b. Using your expansion in 3(a) to evaluate $(1.025)^5$ correct   5 significant

    Figures.

4a. Find the coefficient of x^5 in the expansion of $(2x - 1)^9$

4b. From first principle, find the derivative of $\sin x$

5a. Factorize $f(x) = x^3 - 7x^2 + 14x - 8$ completely.

5b. Find the range of values of x for which, $\dfrac{x^2}{2} - 5x + 1$ is decreasing.

PART II: ANSWER FIVE QUESTIONS IN THIS PART. (12 marks each)

6. Find the derivative of the following

    i. $(3x^2 - 7)^5$

    ii. $(3x^2 + 1)(2x + 1)^5$

    iii. $4x - x^2$ from first principle.

7. Given the vectors $\boldsymbol{a} = i - 2j + k, \boldsymbol{b} = 2i - 3j + 4k$, find:

i. the unit vector perpendicular to each of the vectors $\boldsymbol{a} \ and \ \boldsymbol{b}$.

ii. the sine of the angle between **a** *and* **b**.

8a. Find the derivative of ae^{-at} with respect to t.

8b. Find the derivative of e^{-3x+1} with respect to x.

9a. Find the length of the tangent to the circle $x^2 + y^2 - 2x - 4y - 4 = 0$ from the point (10,8).

9b. Find the equation of a circle whose center is the origin and radius is 10 units.

10. The motion of a particle from O, is described by the equation $S = \frac{2}{3}t^3 - \frac{17}{2}t^2 + 21t$ where S is the distance in metres, and t the time in seconds. Find the acceleration of the particle when it is momentarily at rest.

11a. If $y = e^{x^3}$ find $\frac{d^3y}{dx^3}$.

11b. If y= 3 $\cos(\frac{x}{3})$, find $\frac{dy}{dx}$ at x $= \frac{3\pi}{2}$

12a. Find the equation of a circle with center (3,3) and radius 3 units.

 b. Find the third derivative of $y = e^{4x}$

c. Evaluate: $\lim\limits_{x \to \infty} \frac{x3-2x^2+3x+1}{3x^3+2x^2+2}$

13a.The adjacent sides of a parallelogram are **AB** = 4**i** – **j** + 3**k** and AC= -2**i** + **j** – 2**k**. Find the area of the parallelogram.

13b. If **A** = a₁**i** + a₂**j** – a₃**k**, and **B** = b₁**i** + b₂**j** - b₃**k** find **A**×**B**.

13c. Show that $f(x) = \frac{\cos x}{x}$ is continuous at $x = \frac{\pi}{2}$.

14a. The distance in meters (m) covered in time (t) in seconds by a body is

S= $5(1-e^{-4t})$. Find

    i.   its velocity when t =1

    ii.   Acceleration when t = 2

14b. Find the equation of a circle whose center is the origin and radius is 5 units.

15a. Find with respect to x, the derivative of $\frac{x^4+x^3}{x^3}$, where $x \neq 0$.

15b. If $\boldsymbol{a} = 2i + 3j + k$ and $\boldsymbol{b} = 4i - 5j + 3k$ find $|(2\boldsymbol{a} + \boldsymbol{b}) \times (\boldsymbol{a} + 2\boldsymbol{b})|$.