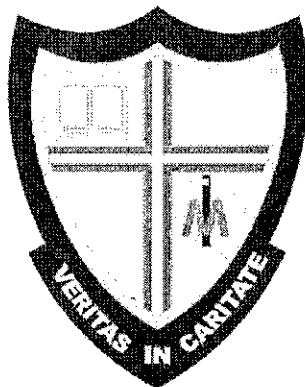




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ST BENEDICT'S

SUBJECT	Mathematics	PAPER	Algebra Part B
GRADE	12	DATE	4 February 2022
EXAMINER	Miss A Balzer	MARKS	39
NAME	Memo	MODERATOR	Gr 12 Teachers
TEACHER	Final	DURATION	45min

QUESTION NO	DESCRIPTION	MAXIMUM MARK	ACTUAL MARK
1	Quadratic Equation	8	
2	Simultaneous Equations	6	
3	Factor and Remainder Theorem	12	
4	Cubic Equations	13	
TOTAL		39	

INSTRUCTIONS:

1. This paper consists of 4 questions and 6 pages.
2. Read the questions carefully.
3. Answer all questions in the spaces provided.
4. You may use an approved non-programmable and non-graphical calculator, unless otherwise stated.
5. Round off your answers to **one decimal digit** where necessary.
6. All necessary working details must be shown. Answers only, without the relevant calculations will not be given marks. Equations may not be solved solely with a calculator.
7. It is in your interest to write legibly and present your work neatly.

QUESTION 1

8 MARKS

a) Solve for k in the following equation:

$$k - 1 + \frac{18}{k+1} = 9$$

(4)

$$(k-1)(k+1) + 18 = 9(k+1)$$

$$k^2 - 1 + 18 = 9k + 9$$

$$k^2 - 9k + 8 = 0$$

$$(k-8)(k-1) = 0$$

$$k = 8 \quad \text{or} \quad k = 1$$

b) Hence, solve for x in the following equation:

$$x^2 + 2 - 1 + \frac{18}{x^2+2x+1} = 9$$

(4)

$$\text{Let } k = x^2 + 2x$$

$$\therefore k - 1 + \frac{18}{k+1} = 9$$

}

must be a link to a)

$$\therefore x^2 + 2x = 8$$

$$x^2 + 2x - 8 = 0$$

$$(x+4)(x-2) = 0$$

$$x = -4 \quad \text{or} \quad x = 2$$

$$\text{or } x^2 + 2x = 1$$

$$x^2 + 2x - 1 = 0$$

$$x = \frac{-2 \pm \sqrt{(2)^2 - 4(1)(-1)}}{2(1)}$$

$$x = -1 + \sqrt{2} \quad \text{or} \quad x = -1 - \sqrt{2}$$

QUESTION 2**6 MARKS**Solve for x and y for the following equations: $x - y = 1$ and $x^2 + y^2 = 25$

$$x = y + 1$$

$$\therefore (y+1)^2 + y^2 = 25$$

$$y^2 + 2y + 1 + y^2 = 25$$

$$2y^2 + 2y - 24 = 0$$

$$y^2 + y - 12 = 0$$

$$(y+4)(y-3) = 0$$

$$y = -4 \quad \text{or} \quad y = 3$$

$$\therefore x = -3$$

$$x = 4$$

QUESTION 3**12 MARKS**a) Calculate the remainder when $x^3 - 2x^2 - x + 2$ is divided by $x - 4$.

(2)

$$\text{Let } f(x) = x^3 - 2x^2 - x + 2$$

$$f(4) = (4)^3 - 2(4)^2 - 4 + 2$$

$$= 54$$

b) If the expression $2x^3 + ax^2 - 4x + 6$ is divided by $x - 1$ the remainder is 1.Calculate the value of a .

(3)

$$\text{Let } f(x) = 2x^3 + ax^2 - 4x + 6$$

$$\therefore f(1) = 1$$

$$2(1)^3 + a(1)^2 - 4(1) + 6 = 1$$

$$a + 4 = 1$$

$$a = -3$$

c) If the expression $3x^3 + 8x^2 + ax + b$ has factors $(x + 2)$ and $(x - 1)$, find the value of a and b .

(7)

$$\text{Let } f(x) = 3x^3 + 8x^2 + ax + b$$

$$f(-2) = 0$$

$$f(1) = 0$$

$$\therefore 3(-2)^3 + 8(-2)^2 + a(-2) + b = 0 \quad \checkmark \quad m$$

$$-24 + 32 - 2a + b = 0$$

$$8 - 2a + b = 0 \quad \checkmark \quad a$$

$$3(1)^3 + 8(1)^2 + a(1) + b = 0 \quad \checkmark \quad m$$

$$3 + 8 + a + b = 0$$

$$11 + a + b = 0 \quad \checkmark \quad a$$

$$\therefore 8 - 2a + b = 11 + a + b \quad \checkmark \quad m$$

$$-3 = 3a$$

$$a = -1 \quad \checkmark \quad a$$

$$11 - 1 + b = 0$$

$$b = -10 \quad \checkmark \quad a$$

QUESTION 4

13 MARKS

Solve for x in the following equations:

a) $8x^3 + 27 = 0$

(2)

$$8x^3 = -27$$

$$x^3 = -\frac{27}{8} \quad \checkmark^m$$

$$x = -\sqrt[3]{\frac{27}{8}} \quad \checkmark^a$$

b) $2x^3 - 9x^2 = -10x$

(5)

$$2x^3 - 9x^2 + 10x = 0 \quad \checkmark^m$$

$$x(2x^2 - 9x + 10) = 0 \quad \checkmark^m$$

$$x(2x - 5)(x - 2) = 0$$

$$x = 0 \quad \checkmark^a \quad \text{or} \quad x = \frac{5}{2} \quad \checkmark^a \quad \text{or} \quad x = 2 \quad \checkmark^a$$

c) $2x^3 + 5x^2 + x - 2 = 0.$

(6)

$$2(-1) + 5(-1)^2 + (-1) - 2 = 0$$

$$\therefore (x+1) \text{ is factor} \quad \checkmark^m$$

$$(x+1)(2x^2 + mx - 2)$$

$$2x^2 + mx^2 = 5x^2$$

$$2 + m = 5$$

$$m = 3$$

 $\checkmark^m$ Any Method

$$\therefore (x+1)(2x^2 + 3x - 2) = 0 \quad \checkmark^a$$

$$(x+1)(2x-1)(x+2) = 0 \quad \checkmark^m$$

$$x = -1 \quad \checkmark^a \quad \text{or} \quad x = \frac{1}{2} \quad \checkmark^a \quad \text{or} \quad x = -2 \quad \checkmark^a$$