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ST BENEDICT'S

SUBJECT	Mathematics	PAPER	Polynomial Functions (Part 1)
GRADE	12	DATE	5 Feb 2019
EXAMINER	Mr Benecke	MARKS	40
NAME	Memo	MODERATOR	Grade 12 Teachers
TEACHER		DURATION	

QUESTION NO	DESCRIPTION	MAXIMUM MARK	ACTUAL MARK
1	Remainder and Factor Theorem	16	
2	Cubic Equations	15	
3	Problem Solving	9	
TOTAL		40	

QUESTION 1

16 MARKS

- a) Find the remainder when $f(x) = 2x^3 - 4x^2 + x - 5$ is divided by $x - 2$ (3)

$$f(2) = 2(2)^3 - 4(2)^2 + (2) - 5 \checkmark$$

$$f(2) = 16 - 16 + 2 - 5 \checkmark$$

$$f(2) = -3 \checkmark$$

The remainder is -3

- b) The expression $x^3 + ax^2 + 3$ has a remainder of 4 when divided by $x + 1$. Determine a . (3)

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

$$-1 + a + 3 = 4$$

$$a = 2 \checkmark$$

c) Given $g(x) = 2x^3 - 26x - 24$

1) Calculate $g(-3)$ (2)

$$g(-3) = 2(-3)^3 - 26(-3) - 24 \checkmark$$

$$g(-3) = 0 \checkmark$$

2) Explain the meaning of your answer in (1). (2)

$x + 3$ is a factor of $g(x)$ $\checkmark \checkmark$

or "When $g(x)$ is divided by $x + 3$ there is no remainder"

3) Factorise $g(x)$ completely. (6)

$$2x^3 - 26x - 24$$

$$= (x + 3) \checkmark (2x^2 \checkmark - 6x \checkmark - 8 \checkmark)$$

$$= 2(x + 3)(x^2 - 3x - 4) \checkmark$$

$$= 2(x + 3)(x - 4)(x + 1) \checkmark$$

QUESTION 2

15 MARKS

a) In each of the following, solve for x :

1) $2(x + 10)^3 - 54 = 0$ (3)

$$2(x + 10)^3 = 54$$

$$(x + 10)^3 = 27 \checkmark$$

$$x + 10 = 3 \checkmark$$

$$x = -7 \checkmark$$

2) $x^3 + x^2 - 16x = 16$ (5)

$$x^3 + x^2 - 16x - 16 = 0 \checkmark$$

$$x^2(x + 1) - 16(x + 1) = 0 \checkmark$$

$$(x + 1)(x^2 - 16) = 0 \checkmark$$

$$(x + 1)(x - 4)(x + 4) = 0 \checkmark$$

$$x = -1 \text{ or } x = 4 \text{ or } x = -4 \checkmark$$

3) $6x^3 - 5x^2 - 17x + 6 = 0$ (7)

$$\text{Let } f(x) = 6x^3 - 5x^2 - 17x + 6$$

$$f(2) = 6(2)^3 - 5(2)^2 - 17(2) + 6 \checkmark$$

$$f(2) = 0$$

$$\therefore x - 2 \text{ is a factor } \checkmark$$

$$(x - 2)(6x^2 \checkmark + 7x \checkmark - 3) \checkmark = 0$$

$$(x - 2)(3x - 1)(2x + 3) = 0 \checkmark$$

$$x = 2 \text{ or } x = \frac{1}{3} \text{ or } x = -\frac{3}{2} \checkmark$$

QUESTION 3

9 MARKS

- a) Determine what must be added to $3x^3 + 4x^2 - 5x - 6$ to make it exactly divisible by $(x - 1)$. (3)

$$f(1) = 3(1)^3 + 4(1)^2 - 5(1) - 6 \checkmark$$

$$f(1) = -4 \checkmark$$

$\therefore$ 4 needs to be added $\checkmark$

- b) The expressions $2x^3 - 5x^2 + 2px + 52$ and $x^3 + 3px^2 + 11x - 6$ leaves the same remainder when divided by $x - 2$. Find the value of p (6)

$$f(2) = 2(2)^3 - 5(2)^2 + 2p(2) + 52 \checkmark$$

$$f(2) = 4p + 48 \checkmark$$

$$f(2) = (2)^3 + 3p(2)^2 + 11(2) - 6 \checkmark$$

$$f(2) = 12p + 24 \checkmark$$

$$4p + 48 = 12p + 24 \checkmark$$

$$-8p = -24$$

$$p = 3 \checkmark$$