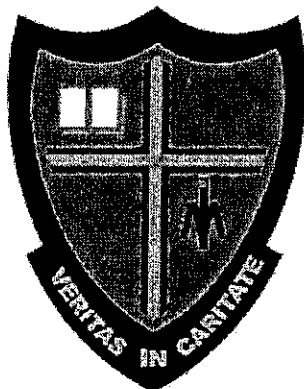




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MEMO

ST BENEDICT'S

SUBJECT	Mathematics	PAPER	Test 1 Algebra Part A
GRADE	12	DATE	5 Feb
EXAMINER	C Botha	MARKS	40
NAME		MODERATOR	Gr 12 Teachers
TEACHER		DURATION	40 min

QUESTION NO	DESCRIPTION	MAXIMUM MARK	ACTUAL MARK
1	Question 1	9	
2	Question 2	8	
3	Question 3	7	
4	Question 4	11	
5	Question 5	5	
TOTAL		40	

Formula you might need: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

QUESTION 1

Solve for x :

a) $x^2 = 7x$

(2)

$$\begin{aligned} x^2 - 7x &= 0 \\ x(x-7) &= 0 \\ x=0 \checkmark \quad x=7 \checkmark \end{aligned}$$

b) $(x-3)^2 = 16$

(2)

$$\begin{aligned} x-3 &= \pm 4 \\ x &= 3 \pm 4 \\ x=7 \checkmark \quad x=-1 \checkmark \end{aligned}$$

$$\begin{aligned} x^2 - 6x + 9 &= 16 \\ x^2 - 6x - 7 &= 0 \\ (x-7)(x+1) &= 0 \\ x=7 \quad x=-1 \end{aligned}$$

c) $2x - \sqrt{25x-1} = -3$

(5)

$$\begin{aligned} (2x+3)^2 &= (\sqrt{25x-1})^2 \\ 4x^2 + 12x + 9 &= 25x - 1 \\ 4x^2 - 13x + 10 &= 0 \\ (4x-5)(x-2) &= 0 \\ \therefore 4x=5 \quad x=2 \\ x &= \frac{5}{4} \end{aligned}$$

Both valid. Check? $\begin{pmatrix} -1 \end{pmatrix}$

QUESTION 2

8 MARKS

a) Simplify: $\frac{16^x \cdot 81^{2x-1} \cdot 6^{-4x}}{9^{x-0,5}}$

(5)

$$\begin{aligned}
 & \frac{2^{4x} \cdot 3^{8x-4} \cdot 2^{-4x} \cdot 3^{-4x}}{3^{2x-1}} \\
 &= 2^{4x-4x} \cdot 3^{8x-4-4x-2x+1} \\
 &= 3^{2x-3} \quad \text{CA.}
 \end{aligned}$$

b) Solve for x : $5^x \cdot 5^{x-2} = \frac{25^{2x}}{5}$

(3)

$$\begin{aligned}
 5 \cdot 5^x \cdot 5^{x-2} &= 5^{4x} \\
 5^{2x-1} &= 5^{4x}
 \end{aligned}$$

$$\therefore 2x-1 = 4x$$

$$-1 = 2x$$

$$\frac{-1}{2} = x \quad \text{CA.}$$

QUESTION 3

Given $f(x) = x^2 - 3x - 4$ and $g(x) = x + 1$

Calculate the following:

a) x if $\frac{1}{f(x) \cdot g(x)}$ is undefined

(4)

$$\frac{1}{(x^2 - 3x - 4)(x + 1)} \checkmark$$

$$= \frac{1}{(x - 4)(x + 1)(x + 1)} \checkmark$$

$$= \frac{1}{(x + 1)^2(x - 4)} \checkmark$$

Undefined if $x = -1$ $\checkmark$
or $x = 4$ $\checkmark$

4.

b) x if $f(x) \leq 0$

(3)

$$x^2 - 3x - 4 \leq 0 \checkmark$$

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



$$-1 \leq x \leq 4 \checkmark$$

3

a) -2 is one root of the equation $px^2 + 4 + (p + 3)x = 0$

1. Determine the value of p

(2)

$$\begin{aligned} p(-2)^2 + 4 + (p+3)(-2) &= 0 \\ 4p + 4 - 2p - 6 &= 0 \\ 2p - 2 &= 0 \\ 2p &= 2 \\ p &= 1 \end{aligned}$$

2. Hence determine the value of the other root

(3)

$$\begin{aligned} x^2 + 4 + 4x &= 0 \\ x^2 + 4x + 4 &= 0 \\ (x+2)^2 &= 0 \\ \therefore \text{Both roots are } -2 \end{aligned}$$

b) Discuss the nature of the roots of $x^2 = 3x + 10$ without solving for x

(2)

$$x^2 - 3x - 10 = 0$$

$$\Delta = (-3)^2 - 4(1)(-10)$$

$$= 9 + 40$$

$$= 49$$

$\therefore$ Real, Rational, Unequal

c) Determine the value of k if the roots of $k = \frac{4x+3}{x^2}$ are real

(4)

$$kx^2 - 4x - 3 = 0$$

$$\Delta = (-4)^2 - 4(k)(-3)$$

$$= 16 + 12k$$

$$\therefore 16 + 12k \geq 0$$

$$12k \geq -16$$

$$k \geq -\frac{16}{12}$$

$$\geq -\frac{4}{3}$$

QUESTION 5

5 MARKS

Solve for x and y in the following set of simultaneous equations:

$$3x + y = -1$$

$$9x^2 = y^2$$

$$\begin{aligned} y &= -1 - 3x \quad \text{A.} \\ 9x^2 &= (-1 - 3x)^2 \quad \text{m.} \\ 9x^2 &= 1 + 6x + 9x^2 \\ 0 &= 1 + 6x \\ 6x &= -1 \\ x &= -\frac{1}{6} \quad \text{A.} \\ \therefore y &= -3\left(-\frac{1}{6}\right) - 1 \quad \text{m.} \\ &= +\frac{1}{2} - 1 \\ &= -\frac{1}{2} \quad \text{A.} \end{aligned}$$

TOTAL: 40

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