

Question 1

a) $x^2 = 10 - 3x$
 $x^2 + 3x - 10 = 0$
 $(x+5)(x-2) = 0$ ✓
 $x = -5$ ✓ or $x = 2$ ✓ (3)

ii) $3x^2 + 2x - 4 = 0$
 $x = \frac{-2 \pm \sqrt{(2)^2 - 4(3)(-4)}}{2(3)}$ ✓
 $x = 0,87$ ✓ or $x = -1,54$ ✓ (3)

iii) $2^x(x-8) \geq 0$
 $x-8 \geq 0$ ✓
 $x \geq 8$ ✓ (2)

iv) $(x^2+2)^2 - x^2 - 2 = 6$
 let $x^2+2 = k$
 $k^2 - k - 6 = 0$ ✓
 $(k-3)(k+2) = 0$ ✓
 $\therefore x^2+2-3=0$ or $x^2+2+2=0$
 $x^2-1=0$ or $x^2=-4$
 $(x-1)(x+1)=0$ ✓ no sol. ✓
 $x = \pm 1$ ✓ (5)

b. $y = x^2 - x - 6$... (1) $2x - 2 = y$... (2)
 (2) in (1) $2x - 2 = x^2 - x - 6$ ✓
 $x^2 - 3x - 4 = 0$
 $(x-4)(x+1) = 0$ ✓
 $x = 4$ ✓ or $x = -1$ ✓
 $y = 2(4) - 2$ or $y = 2(-1) - 2$
 $= 6$ ✓ or $= -4$ ✓
 $(4; 6)$ or $(-1; -4)$ (6)

Question 2

ai) $4 = \sqrt{(x+1)^2 - 4}$ ✓
 $16 = (x+1)^2 - 4$ ✓
 $x^2 + 2x + 1 - 20 = 0$
 $x^2 + 2x - 19 = 0$
 $x = -1 + 2\sqrt{5}$ ✓ or $x = -1 - 2\sqrt{5}$ (4)

ii) $k=0$; $x=1$ or $x=-3$ (3)

bi) $3^{x+1} + 2 \cdot 3^x = 45$
 $3^x(3+2) = 45$ ✓
 $3^x = 9$ ✓
 $\therefore x = 2$ ✓ (3)

ii) $2^{x+1} - 2^x = 4$
 $2^{2x+1} - 4^x = 4$
 $2^x(2-1) = 4$ ✓
 $2^{2x}(2-1) = 4$ ✓
 $\frac{1}{2^x} = 4$ ✓
 $2^{-x} = 2^2$ ✓
 $\therefore x = -2$ ✓ (5)

c. $(2 - 3\sqrt{x})(2 + 3\sqrt{x}) = 13$
 $4 - 9x = 13$ ✓
 $9x = -9$ ✓
 $x = -1$ ✓

but $x \neq -1$ as $\sqrt{-1}$ is non-real.
 \therefore no real solution
 any acceptable, reasonable answer. (4)

Question 3

a) $1+i = (1 + \frac{0,072}{12})^{12}$ ✓
 $1+i = 1,074 \dots$ ✓
 $i = 7,44\% \text{ p.a.}$ ✓ (3)

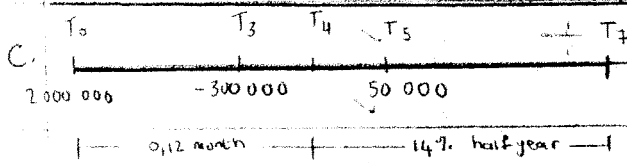
ii) $A = 120\,000(1 + 0,0744)^3$ ✓
 $= R148\,826,15$ ✓ (3)

OR

$A = 120\,000(1 + \frac{0,072}{12})^{36}$ ✓
 $= R148\,836,19$ ✓

b) $A = 550\,000(1 - 0,17 \times 3)$ ✓
 $= R269\,500$ ✓ (2)

ii) $269\,500 = 550\,000(1 - i)^3$ ✓
 $0,49 = (1 - i)^3$ ✓
 $0,788 \dots = 1 - i$ ✓
 $i = 0,2116 \dots$ ✓
 $= 21,16\%$ ✓ (4)



$A = 2\,000\,000(1 + \frac{0,12}{12})^{48}(1 + \frac{0,14}{2})^6$ ✓
 $-300\,000(1 + \frac{0,12}{12})^{12}(1 + \frac{0,14}{2})^6 + 50\,000(1 + \frac{0,14}{2})^4$ ✓
 $= R4\,397\,254,86$ ✓ (7)

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Question 4

ai) $B(230; -60)$ (1)

ii) $C(125; 132)$ (2)

Question 5

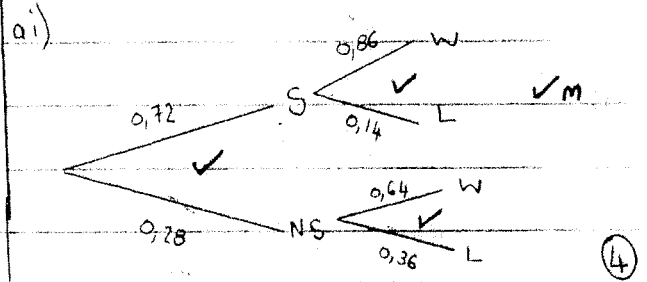
a) $a = 1879$ ✓
 $b = 3898$ ✓
 $c = 731$ ✓
 $d = 8120$ ✓
 $e = 10730$ ✓ (3)

b) $P(FA) = \frac{6101}{10730}$ ✓ (1)

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Section B

Question 6



ii) $P(W) = (0,72 \times 0,86) + (0,28 \times 0,64)$ ✓
 $= 0,7984$ ✓ or $\frac{499}{625}$ or $79,84\%$ (3)

b) $1 - (\frac{5}{6} \times \frac{5}{6} \times \frac{5}{6} \times \frac{5}{6})$ ✓
 $= 671$ ✓ = $0,52$ = $51,77\%$ (3)

Question 7

ai) shift 1 unit up. ✓

ii) shift 2 units to the right ✓

iii) reflect in the y-axis. ✓ (3)

b) $h(x) = \frac{k}{x+2} + 4$

$5 = \frac{k}{2+2} + 4$

$1 = \frac{k}{4}$

$k = 4$

$\therefore h(x) = \frac{4}{x+2} + 4$ (3)

ci) $g(x) = x+2$

$0 = x+2$

$x = -2 \therefore B(-2, 0)$ (2)

ii) $y = a(x+2)(x+12)$

$-11 = a(-13+2)(-13+12)$

$-11 = 11a$

$a = -1$

$\therefore y = -(x+2)(x+12)$

$= -x^2 - 14x - 24$ (4)

iii) T.P. $x = \frac{-(-14)}{2(-1)} = -7$

$y = -(-7)^2 - 14(-7) - 24 = 25$

$\therefore E(-7, 25)$

F: $y = -7 + 5 = -5 \therefore F(-7, -5)$

$\therefore EF = 25 - (-5) = 30$ units (4)

OR

$EF = -x^2 - 14x - 24 - (x+2)$

$= -x^2 - 15x - 26$

$= -(-7)^2 - 15(-7) - 26$

$= 30$ units

iv) $x \leq -13$ or $x \geq -2$ (2)

v) $x \leq -12$ (2)

vi) $k < 22$ (1)

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Question 8

ai) $3, 6, 10, 15, 21$ (1)

ii) $a = \frac{1}{2}$ $3(\frac{1}{2}) + b = 3$ $\frac{1}{2} + \frac{3}{2} + c = 3$

$b = \frac{3}{2}$ $c = 1$

$\therefore T_n = \frac{1}{2}n^2 + \frac{3}{2}n + 1$ (4)

bi) $10; 14; 18$ (2)

ii) $2a = 4$

$a = 2$

iii) $3(2) + b = 10$ $2 + 4 + c = 1$

$b = 4$ $c = -5$

$\therefore T_n = 2n^2 + 4n - 5$ (4)

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Question 9

a) $f(x) = a \cdot b^x - 3$

$-2 = a \cdot b^0 - 3$

$a = 1$

$-1 = 1 \cdot b^1 - 3$

$b = 2$

$\therefore f(x) = 2^x - 3$ (4)

b) Shift one unit to the left. (1)

[5]

Question 10

ai) $4k + 12x = 180$

$k = 45 - 3x$ (2)

ii) $V = k \cdot x^2$

$= (45 - 3x)x^2$

$= 45x^2 - 3x^3$ (2)

b) $45x^2 - 3x^3 = 0$

$3x^2(15 - x) = 0$

$x = 15$ cm (2)

(2)

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Question 11

a. R150 000 ✓ (1)

b. reducing balance ✓ (1)

c. $110\ 940 = 150\ 000 (1-i)^2$ ✓

$$0,7396 = (1-i)^2$$

$$\frac{43}{50} = 1-i$$

$$i = 0,14$$

$$= 14\% \quad \checkmark$$

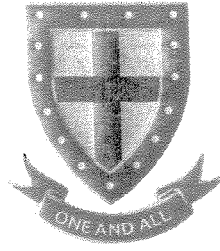
(2)

d. $A = 150\ 000 (1 - 0,14)^{74}$

$$= R52\ 189,17 \quad \checkmark$$

(4)

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ST STITHIANS GIRLS' COLLEGE

GRADE 11
MATHEMATICS: PAPER 1
 November 2014

TIME: 3 hours

MARKS: 150

EXAMINER: Mr M Ancillotti

MODERATOR: Mrs V Germishuys

NAME: _____

TEACHER: Mr Statham

Mrs Germishuys

Mrs Garofoli

Mr Ancillotti

ANSWER BOOKLET

FOR EXAMINER'S USE ONLY

Question	1	2	3	4	5	6	7	8	9	10	11	TOTAL
AIM 1 Probability					/4	/22						/26
AIM 2 Algebra, Patterns & Sequences, Functions & Graphs, Finance.	/19	/19	/19	/14			/21	/13	/5	/6	/8	/124
TOTAL											/150	
												%

QUESTION 4

b) Given: $f(x) = \frac{-2}{x+1} - 3$

- i) Calculate the coordinates of the y-intercept of f . (2)

$$y = \frac{-2}{0+1} - 3 \quad \checkmark$$

$$= -5$$

$$\therefore (0; -5) \quad \checkmark$$

- ii) Calculate the coordinates of the x-intercept of f . (2)

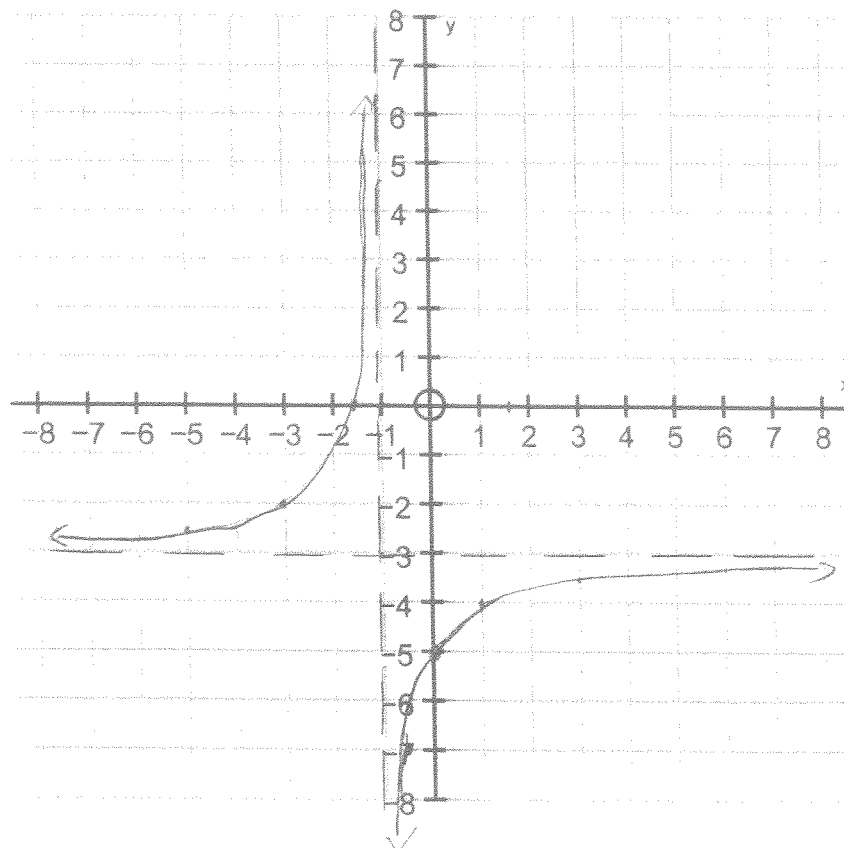
$$0 = \frac{-2}{x+1} - 3 \quad \checkmark$$

$$3x + 3 = -2$$

$$3x = -5$$

$$x = -\frac{5}{3} \quad \therefore \left(-\frac{5}{3}; 0\right) \quad \checkmark$$

- iii) Sketch the graph of f , showing clearly the asymptotes and the intercepts with the axes. (3)



✓ asymptotes

✓ intercepts

✓ shape

- iv) One of the axes of symmetry of f is a decreasing function.
Write down the equation of this axis of symmetry. (2)

$$y = -(x+1) - 3$$

$$y = -x - 4$$

- v) If $g(x) = f(x-2) + 4$, determine the range of $g(x)$. (2)

$$y \in \mathbb{R} ; y \neq 1$$

RETURN TO QUESTION PAPER – QUESTION 5

QUESTION 6

- c) A survey was conducted using the Grade 11 girls at St Stithians Girls' College, where there are 100 girls in the grade. The survey looked at the T.V. viewing preferences of the girls using the following programs: The Maths Learning Channel (*LC*), Gray's Anatomy (*GA*) and Hot Gym Boys (*GB*).

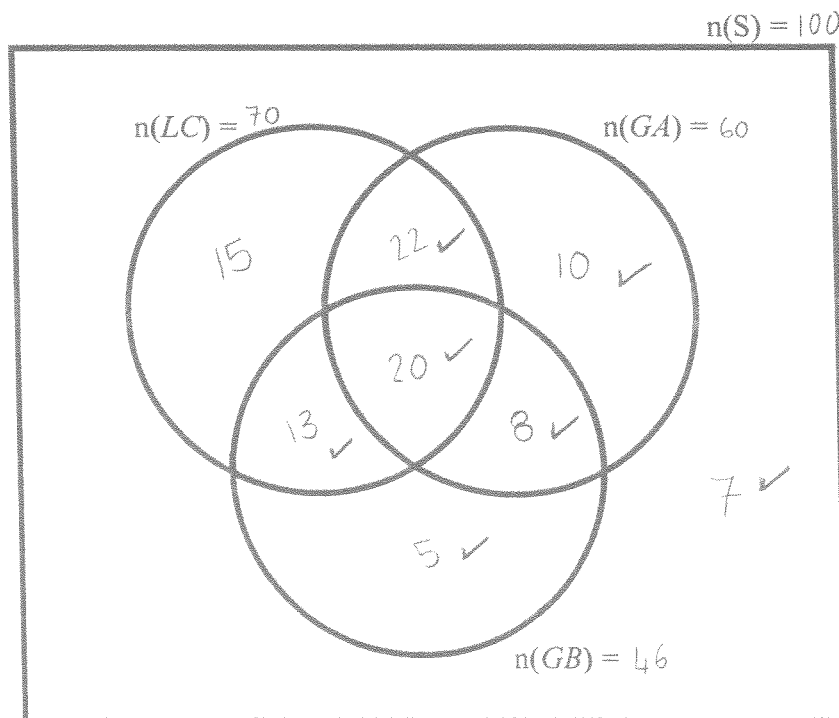
The viewing preference results are summarised as follows:

Learning Channel (*LC*): 70 Gray's Anatomy (*GA*): 60 Gym Boys (*GB*): 46

Only Learning Channel (*LC*): 15 Only Gray's (*GA*): 10 All three: 20

Learning Channel and Gray's: 42

- i) Represent the given information using the Venn Diagram. (7)



Space for rough working

- ii) What is the probability that a randomly selected student will not watch any of the programs? (2)

$$P(\text{none}) = \frac{7}{100} \checkmark$$

- iii) Are the events "Gray's" and "Gym Boys" independent? Give a mathematical motivation for your answer. (3)

$$P(GA) \times P(GB) = \frac{60}{100} \times \frac{46}{100} = \frac{36}{125} \checkmark$$

$$P(GA \cap GB) = \frac{28}{100} = \frac{7}{25} \checkmark$$

\(\therefore\) not independent \(\checkmark\) as $P(GA \cap GB) \neq P(GA) \times P(GB)$

RETURN TO QUESTION PAPER – QUESTION 7