MATHEMATICS
GRADE 11
EXAMINATION PAPER 1
10 NOVEMBER 2014

SECTION A
QUESTION 1

(a) $$\frac{2x^2-9x-5}{10-2x}$$

$$= \frac{(x-5)(2x+1)}{-2(x-5)} \checkmark\checkmark$$

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

(3)

(b) $$\frac{7^{a-2}\cdot 2^{a-2}}{14^{a-1}\cdot 2} = \frac{7^{a-2}\cdot 2^{a-2}}{2^{a-1}\cdot 7^{a-1}\cdot 2} \checkmark$$

$$= 7^{a-2-a+1}\cdot 2^{a-2-a+1-1} \checkmark$$

$$= 7^{-1}\cdot 2^{-2}$$

$$= \frac{1}{28} \checkmark$$

(3)

(c) $$\frac{3^{x+1}+3^x}{m\cdot 3^x+4\cdot 3^x} - \frac{3m-12}{m^2-16}$$

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

$$= \frac{4}{m+4} - \frac{3}{m+4}$$

$$= \frac{1}{m+4} \checkmark$$

(5)
[11]

QUESTION 2

(a) $2x^2 - 5x = 2$

$2x^2 - 5x - 2 = 0$

$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-2)}}{2(2)}$ ✓

$= \frac{5 \pm \sqrt{41}}{4}$ ✓

$x \approx 2,9$ or $x \approx -0,4$ ✓ (3)

(b) $(x-2)^2 = (-\sqrt{2x-5})^2$

$x^2 - 4x + 4 = 2x - 5$ ✓

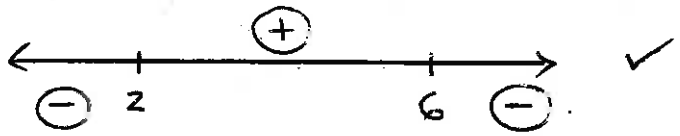
$x^2 - 6x + 9 = 0$

$(x-3)(x-3) = 0$ ✓

$x \neq 3$ ✓

N.A. ∴ No solutions ✓ (4)

(c) $(2-x)(x-6) > 0$



✓

$2 < x < 6$ ✓✓ (3)

[10]

QUESTION 3

(a) $\Delta = b^2 - 4ac$

$= (2)^2 - 4(3)(-k+1)$ ✓

$= 4 + 12k - 12$

$= 12k - 8$ ✓

$12k - 8 \geq 0$ ✓

$k \geq \frac{2}{3}$ ✓ (4)

(b) $2^{3x+1} = 4^{y}$ $\qquad x^2 + 2y = 29$ — (2)

$2^{3x+1} = 2^{2y}$

$3x + 1 = 2y$ — (1) ✓

Substitute (1) into (2)

$x^2 + (3x + 1) = 29$ ✓

$x^2 + 3x - 28 = 0$

$(x + 7)(x - 4) = 0$ ✓

$x = -7$ or $x = 4$ ✓

$3(-7) + 1 = 2y$ $\qquad 3(4) + 1 = 2y$

$y = -10$ ✓ $\qquad y = \frac{13}{2}$ ✓

(6)

[10]

QUESTION 4

(a) $T_n = 101$ ✓

$20 + (n-1)(3) = 101$ ✓

$20 + 3n - 3 = 101$

$3n = 84$

$n = 28$ ✓

(3)

(b) 23 ; 29 ; 35 ; 41 ; ... ; 101

$S_5 = 23 + 29 + 35 + 41 + 47$ ✓

$= 175$ ✓

(2)

[5]

QUESTION 5

(a) (1) $\frac{x^4}{27}$ ✓

(1)

(2) Multiply ✓ by $\frac{x}{3}$. ✓

(2)

(b) $T_2 = 4$ $\qquad$ $T_5 = -17$

$a + d = 4$ ✓ $\qquad$ $a + 4d = -17$ — ② ✓

$a = 4 - d$ — ①

Substitute ① into ②

$(4 - d) + 4d = -17$ ✓

$3d = -21$

$d = -7$ ✓

$a = 4 - (-7)$

$= 11$ ✓

OR:

$-17 - 4 = -21$ ✓

$d = \frac{-21}{3}$ ✓ $= -7$ ✓

$a = 4 + 7$ ✓ $= 11$ ✓

(5)

[8]

QUESTION 6

(a) (1) $(1 + i) = \left(1 + \frac{i^{(12)}}{12}\right)^{12}$

$1 + i = \left(1 + \frac{0,065}{12}\right)^{12}$ ✓

$i = 0,066971\ldots$

$i = 6,7\%$ ✓

(2)

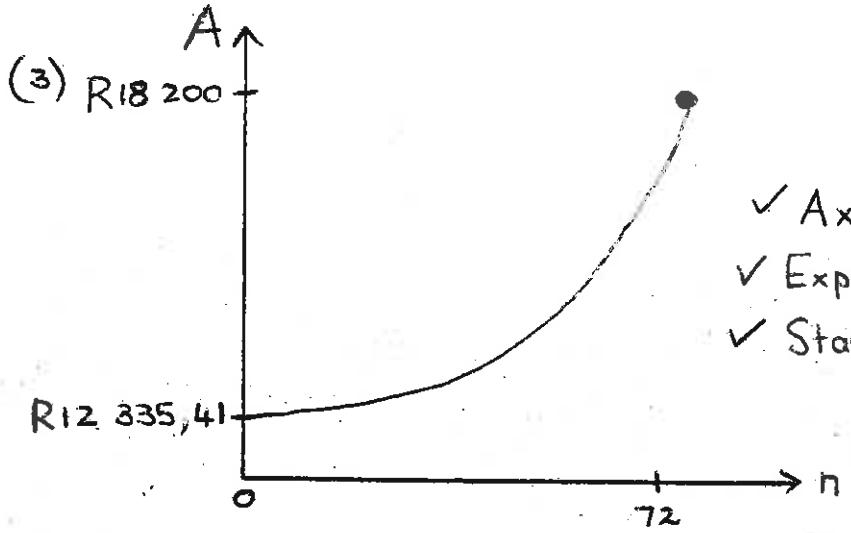
(2) $18\,200 = P\left(1 + \frac{0,065}{12}\right)^{72}$ ✓

$P = \frac{18\,200}{1,47542\ldots}$ ✓

$P = R12\,335,41$ ✓

(3)

(3)



✓ Axes
✓ Exponential graph
✓ Start and end values

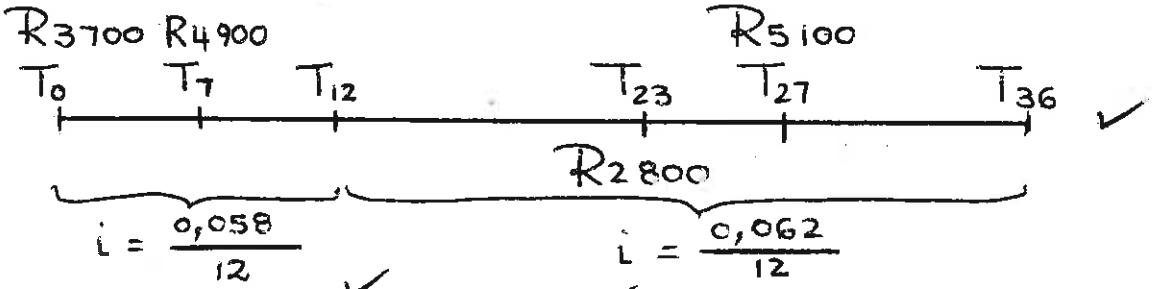
(3)

(b) $A = 42\,000(1 - 0,16)^3$ ✓

$= R24\,893,57$ ✓

(2)

(c)



✓

$3\,700\left(1 + \frac{0,058}{12}\right)^{12}\left(1 + \frac{0,062}{12}\right)^{24} + 4\,900\left(1 + \frac{0,058}{12}\right)^{5}\left(1 + \frac{0,062}{12}\right)^{24}$

$2\,800\left(1 + \frac{0,062}{12}\right)^{13} + 5\,100\left(1 + \frac{0,062}{12}\right)^{9}$ ✓

$= R12\,465,05$ ✓

(8)

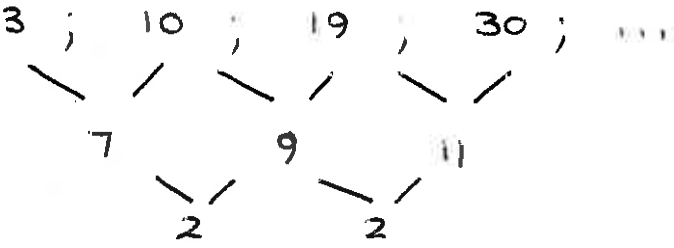
[18]

SECTION A: [62]

SECTION B

QUESTION 7

(a)



$2a = 2$ ✓ $\quad 3a + b = 7$ $\quad a + b + c = 3$

$a = 1$ ✓ $\quad 3(1) + b = 7$ $\quad 1 + 4 + c = 3$

$b = 4$ ✓ $\quad c = -2$ ✓

$T_n = n^2 + 4n - 2$ ✓

(4)

(b) $T_{24} = (24)^2 + 4(24) - 2$ ✓ ca from (a)

$= 670$ ✓ ca

(2)

(c) $n^2 + 4n - 2 = 2\,110$ ✓ ca from (a)

$n^2 + 4n - 2\,112 = 0$

$(n - 44)(n + 48) = 0$ ✓

$n = 44$ hours ✓

} ONLY 1 ca mark if equation in (a) was linear

(3)

[9]

QUESTION 8

(a) $4^{-x} - 8 = 0$ ✓

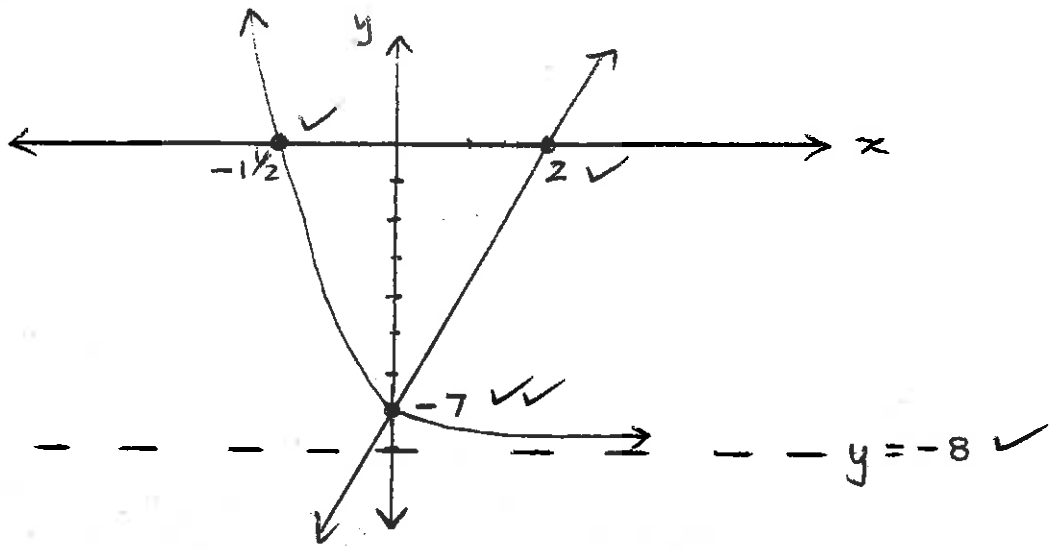
$2^{-2x} = 2^3$

$-2x = 3$ ✓

$x = \frac{-3}{2}$ ✓ $\quad (-1{,}5 ; 0)$

(3)

(b)



(5)

(c) $y \in (-8; \infty)$ ✓✓

(2)

(d) $x \in (-1\frac{1}{2}; 2)$ ✓✓

(2)

[12]

QUESTION 9

(a) $b = 1$ ✓ and $c = 2$ ✓

$$g(x) = \frac{a}{x-1} + 2$$

$$0 = \frac{a}{\quad} + 2 \quad \checkmark$$

$$a = 2 \quad \checkmark$$

(4)

(b) $x = -2$ ✓ and $y = -3$ ✓

(2)

(c) $f(1) = 4(1)^2 - 8(1) - 5 = -9$

$(-1$ ✓; -9 ✓$)$

(2)

(d) $f(x) - k = 0$

$-9 < k < -5$ ✓✓

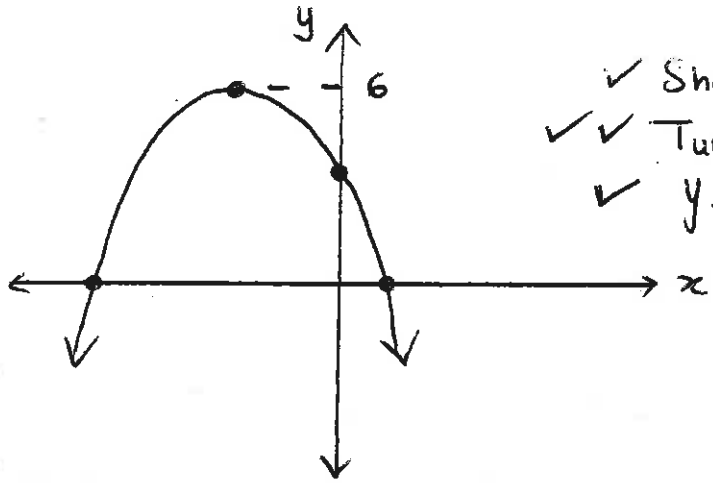
(2)

(e) 3 solutions ✓

(1)

[11]

QUESTION 10

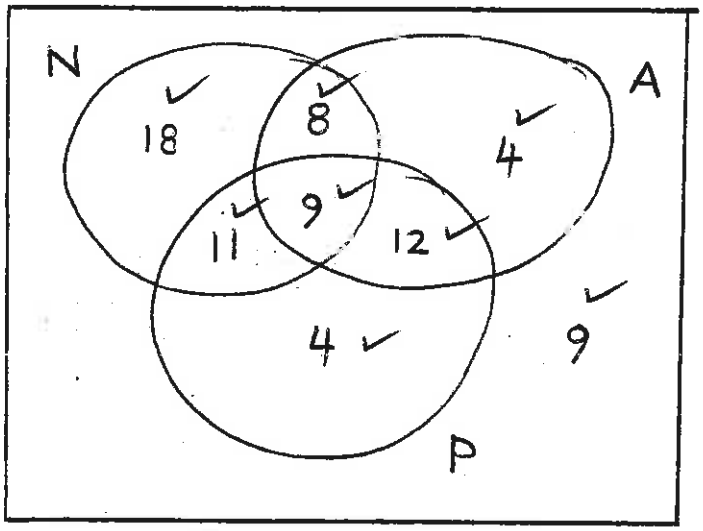


✓ Shape
✓✓ Turning point
✓ y-int

[4]

QUESTION 11

(a)



(8)

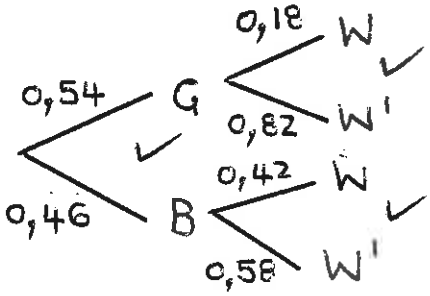
(b) $\frac{18}{75} = 0,24$ ✓

(1)

[9]

QUESTION 12

(a)



$(0,54 \times 0,82) + (0,46 \times 0,58)$

$= 0,7096$ ✓

(6)

(b) $\frac{48}{60} \times \frac{20}{60} = \frac{A}{60}$ ✓

$\frac{4}{15} = \frac{A}{60}$ ✓

$A = 16$ ✓

$B = 20 - 16$ ✓
$= 4$

$C = 48 - 16$ ✓
$= 32$

(5)
[11]

QUESTION 13

(a) 500 g ✓

(1)

(b) 8 % ✓

(1)

(c) $m(50) = 500(0,92)^{50}$ ✓
$= 7,7$ g ✓

(2)

(d) Rate of change $= \frac{m(15) - m(10)}{15 - 10}$

$= \frac{500(0,92)^{15} - 500(0,92)^{10}}{5}$ ✓

$= \frac{-74,045525 \ldots}{5}$ ✓

$= -14,8$ g/year ✓

(3)
[7]

SECTION B: [63]
TOTAL: [125]