



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE/
*SETIFIKEITI SE PHAHAMENG
SA NAHA***

GRADE/*KEREITE* 12

SEPTEMBER 2021



**MATHEMATICS P1/*DIPALO P1*
MARKING GUIDELINE/*DITATAISO TSA HO
TSHWAYA***

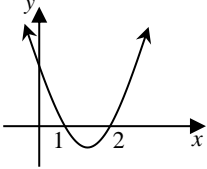
MARKS/*MATSHWAO*: 150

This marking guideline consists of 22 pages./
Tataiso ena ya ma tshwao ena le maqephe a 22.

NOTE/NEHA HLOKO:

- If a candidate answers a question TWICE, mark the FIRST attempt ONLY.
Haeba mohlalubuwa o arabile ha bedi tshwaya leko ya PELE FEELA.
- Consistent accuracy applies in ALL aspects of the marking guideline.
Tumellano e nepahetseng e sebetsa ho di karolo KAOFELA ho tshwayo.
- If a candidate crossed out an attempt of a question and did not redo the question, mark the crossed-out attempt.
Haeba mohlalubuwa o hlabile teko ya potso a seka bela a araba potso, tshwaya tefo e hlajiweng.
- The mark for substitution is awarded for substitution into the correct formula.
Le tshwao la sabustitshushini le fowa ho sabusitikhushini e nepahetseng ya meralo.

QUESTION 1/POTSO 1

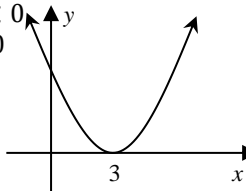
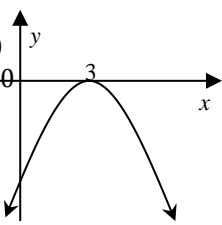
1.1.1	$x^2 + 2x - 15 = 0$ $(x - 3)(x + 5) = 0$ $\therefore x = 3 \quad \text{or / of} \quad x = -5$ <p style="text-align: center;">OR/KAPA</p> $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-2 \pm \sqrt{2^2 - 4(1)(-15)}}{2(1)}$ $= \frac{-2 \pm \sqrt{64}}{2}$ $= 3 \quad \text{or / of} \quad -5$	<p>✓ factors / <i>fekethas</i></p> <p>✓ $x = 3$ ✓ $x = -5$</p> <p style="text-align: center;">OR/KAPA</p> <p>✓ substitution / <i>sabusithitshushini</i></p> <p>✓ $x = 3$ ✓ $x = -5$</p> <p style="text-align: right;">(3)</p>
1.1.2	$3x^2 + x - 1 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-1 \pm \sqrt{1^2 - 4(3)(-1)}}{2(3)}$ $= \frac{-1 \pm \sqrt{13}}{6}$ $= 0,43 \quad \text{or / of} \quad -0,77$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> Penalise 1 mark for incorrect rounding <i>Penaliseer 1 punt vir verkeerde afronding</i> </div>	<p>✓ substitution / <i>sabosititshushini</i></p> <p>✓ $x = 0,43$ ✓ $x = -0,77$</p> <p style="text-align: right;">(3)</p>
1.1.3	$x(x - 3) \geq -2$ $x^2 - 3x + 2 \geq 0$ $(x - 1)(x - 2) \geq 0$ $\therefore x \leq 1 \quad \text{or / of} \quad x \geq 2$ <div style="text-align: center;">  </div>	<p>✓ standard form <i>Formo etlwaelehileng</i></p> <p>✓ factorisation <i>fekethoreseishini</i></p> <p>✓ $x \leq 1$ or/of ✓ $x \geq 2$</p> <p style="text-align: right;">(4)</p>

1.1.4	$\sqrt{43-x} - x + 1 = 0$ $\sqrt{43-x} = x - 1$ $(\sqrt{43-x})^2 = (x-1)^2$ $43-x = x^2 - 2x + 1$ $x^2 - x - 42 = 0$ $(x-7)(x+6) = 0$ $\therefore x = 7 \text{ or } x \neq -6$	<ul style="list-style-type: none"> ✓ isolating the surd <i>Ho itlhaola sede</i> ✓ squaring both sides <i>Ho sekwera mahlakori ka bobedi</i> ✓ standard form / foromo <i>etlwaelehileng</i> ✓ factorisation / fekithorisashini ✓ selection / kgetho e nepahetseng <p style="text-align: right;">(5)</p>
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1.2	$2y - x = 3(1)$ $y^2 + 3x = 2xy(2)$ $x = 2y - 3(3)$ Substitute (3) into (2) $y^2 + 3(2y - 3) = 2y(2y - 3)$ $y^2 + 6y - 9 - 4y^2 + 6y = 0$ $-3y^2 + 12y - 9 = 0$ $y^2 - 4y + 3 = 0$ $(y - 3)(y - 1) = 0$ $\therefore y = 3 \text{ or } y = 1$ $x = 2(3) - 3 \text{ or } x = 2(1) - 3$ $= 3 = -1$ <p style="text-align: center;">OR/KAPA</p> $2y - x = 3(1)$ $y^2 + 3x = 2xy(2)$ $y = \frac{x}{2} + \frac{3}{2}(3)$ Substitute(3) into (2) $\left(\frac{x}{2} + \frac{3}{2}\right)^2 + 3x = 2x\left(\frac{x}{2} + \frac{3}{2}\right)$ $\frac{x^2}{4} + \frac{6x}{4} + \frac{9}{4} + 3x = x^2 + 3x$ $-\frac{3x^2}{4} + \frac{6x}{4} + \frac{9}{4} = 0$ $-3x^2 + 6x + 9 = 0$ $x^2 - 2x - 3 = 0$ $(x - 3)(x + 1) = 0$ $\therefore x = 3 \text{ or } x = -1$ $y = \left(\frac{3}{2} + \frac{3}{2}\right) \text{ or } y = \left(-\frac{1}{2} + \frac{3}{2}\right)$ $= 3 = 1$	$\checkmark x = 2y - 3$ $\checkmark \text{ substitution / sabusithikhushini}$ $\checkmark \text{ standard form / foromo etlwaelehileng}$ $\checkmark \text{ factorisation / fekhuthoriseshini}$ $\checkmark \text{ y-values / di y-velu}$ $\checkmark \text{ x-values / di x-velu}$ <p style="text-align: center;">OR/KAPA</p> $\checkmark y = \frac{x}{2} + \frac{3}{2}$ $\checkmark \text{ substitution / sabosititshushini}$ $\checkmark \text{ standard form / foromo etlwaelehileng}$ $\checkmark \text{ factorisation / fekithorishashini}$ $\checkmark \text{ x-values / di x-velu}$ $\checkmark \text{ y-values / di y-velu}$
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(5)

<p>1.3</p>	<p> $x = \frac{5 \pm \sqrt{p(6-p)-9}}{2}$ </p> <p>For non-real roots: $\Delta < 0$ $p(6-p) - 9 < 0$ $-p^2 + 6p - 9 < 0$ $p^2 - 6p + 9 > 0$ $(p-3)^2 > 0$</p> <p>$\therefore p \in \mathbb{R}$ but $p \neq 3$</p> <p>OR/KAPA</p>  <p> $x = \frac{5 \pm \sqrt{p(6-p)-9}}{2}$ </p> <p>For non-real roots: $\Delta < 0$ $p(6-p) - 9 < 0$ $-p^2 + 6p - 9 < 0$ $(3-p)(p-3) < 0$ $\therefore p \in \mathbb{R}$ but $p \neq 3$</p> 	<p> $\checkmark \Delta < 0$ \checkmark standard form / <i>foromo etlwaelehileng</i> \checkmark factorisation / <i>fekithorishashini</i> \checkmark answer / <i>karabo</i> </p> <p>OR/KAPA</p> <p> $\checkmark \Delta < 0$ \checkmark standard form / <i>foromo etlwaelehileng</i> \checkmark factorisation / <i>fekethorisaeshini</i> \checkmark answer / <i>karabo</i> </p> <p style="text-align: right;">(4)</p> <p style="text-align: right;">[24]</p>
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QUESTION 2/ POTOSO 2

2.1.1	$ \begin{array}{ccccccc} -16 & ; & -16 & ; & -12 & ; & -4 \\ & \diagdown & / & \diagdown & / & \diagdown & / \\ & & 0 & & 4 & & 8 \\ & \diagdown & / & \diagdown & / & & \\ & & 4 & & 4 & & \\ & & & & & & 8 \end{array} $	$\checkmark 8$ (1)
2.1.2	$ \begin{aligned} 2a &= 4 \\ \therefore a &= 2 \\ \\ 3a + b &= 4 \\ 3(2) + b &= 4 \\ \therefore b &= -6 \\ \\ a + b + c &= -16 \\ 2 - 6 + c &= -16 \\ \therefore c &= -12 \\ \\ T_n &= 2n^2 - 6n - 12 \end{aligned} $	$\checkmark a = 2$ $\checkmark b = -6$ $\checkmark c = -12$ $\checkmark T_n = 2n^2 - 6n - 12$ (4)
2.1.3	$ \begin{aligned} T_{38} &= 2(38)^2 - 6(38) - 12 \\ &= 2648 \end{aligned} $	\checkmark substitution / <i>sabosetitshushini</i> \checkmark answer / <i>karabo</i> (2)


<p>2.1.4</p>	<p>General term for first differences: <i>Themo ya kakaretso ya phapang ya pele</i> $T_n = 4n - 4$ $400 = 4n - 4$ $\therefore n = 101$ $T_{n(\text{linear})} = (T_{n+1} - T_n)_{(\text{quadratic})}$ $\therefore n = 101 \text{ and } + 1 = 102$ The terms are: 101 and 102</p> <p style="text-align: center;">OR/KAPA</p> $2(n + 1)^2 - 6(n + 1) - 12 - (2n^2 - 6n - 12) = 400$ $2n^2 + 4n + 2 - 6n - 6 - 12 - 2n^2 + 6n + 12 = 400$ $4n - 4 = 400$ $4n = 404$ $\therefore n = 101$ $\therefore \text{Between } T_{101} \text{ and } T_{102}$	<p>✓ $T_n = 4n - 4$ ✓ $T_n = 400$ ✓ answer / karabo (3)</p> <p style="text-align: center;">OR/KAPA</p> <p>✓ $4n - 4 = 400$ ✓</p> <p>✓ answer / karabo (3)</p>
	<p style="text-align: center;">OR/KAPA</p> <p>Trial and error $T_{102} = 2(102)^2 - 6(102) - 12 = 20184$ $T_{101} = 2(101)^2 - 6(101) - 12 = 19784$ Difference : 400 $\therefore \text{Between } T_{101} \text{ and } T_{102}$</p>	<p style="text-align: center;">OR/KAPA</p> <p>✓ subst. for T_{101} and T_{102} <i>Ka T_{101} le T_{102}</i></p> <p>✓ 400 ✓ answer / karabo (3)</p>
<p>2.2.1</p>	<p>$T_n = a + (n - 1)d$ $89 = 2 + (n - 1)(3)$ $3n - 1 = 89$ $3n = 90$ $n = 30$</p>	<p>✓ substitution / sabustikhushini</p> <p>✓ answer / karabo (2)</p>



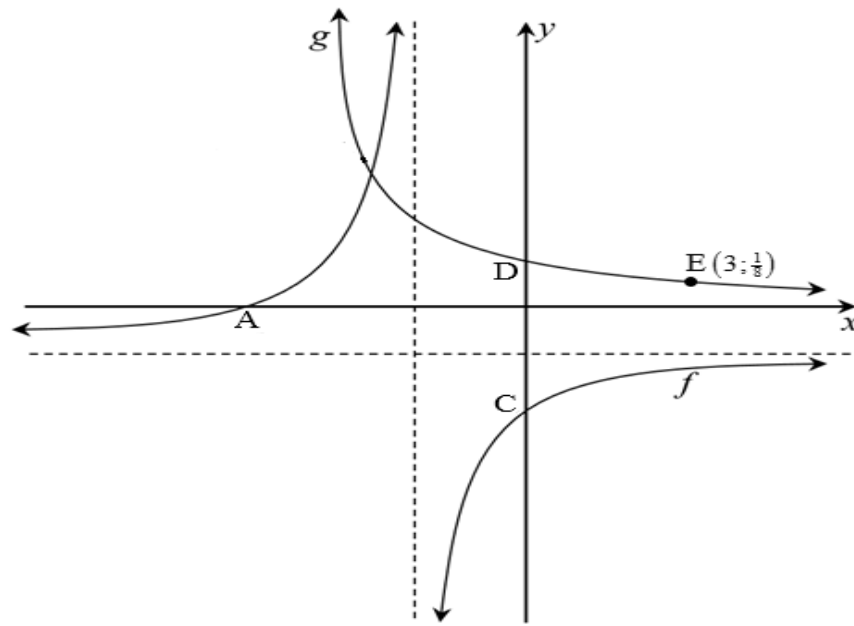
2.2.2	<p><i>k is the sum to 30 terms.</i></p> $S_n = \frac{n}{2}[a + l]$ $= \frac{30}{2}[2 + 89]$ $= 1365$ <p>OR / KAPA</p> $S_n = \frac{n}{2}[2a + (n-1)d]$ $= \frac{30}{2}[2(2) + (30-1)(3)]$ $= 1365$	<p>✓ Sum formula / moralo wa samo</p> <p>✓ substitution / <i>sabositikhushini</i></p> <p>✓ answer / <i>karabo</i></p> <p>OR / KAPA</p> <p>✓ Sum formula / moralo wa samo</p> <p>✓ substitution / <i>sabositikhushini</i></p> <p>✓ answer / <i>karabo</i></p> <p>(3)</p> <p>[15]</p>
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QUESTION 3/ POTSO 3

3.1	$T_9 = ar^8 = 768$ $T_{13} = ar^{12} = 12\,288$ $\frac{ar^{12}}{ar^8} = \frac{12\,288}{768}$ $\therefore r^4 = 16$ $r = \pm 2$ $a = \frac{768}{(\pm 2)^8}$ $= 3$	$\checkmark \frac{ar^{12}}{ar^8} = \frac{12\,288}{768}$ $\checkmark r = \pm 2$ $\checkmark \text{value of } a / \textit{velu ya } a$ <p style="text-align: right;">(3)</p>
3.2.1	$S_2 = \frac{54}{19} - \frac{24}{19}$ $= \frac{30}{19}$	$\checkmark \text{answer / karabo}$ <p style="text-align: right;">(1)</p>
3.2.2	$T_1 + T_2 = \frac{30}{19}$ $a + ar = \frac{30}{19}$ $a(1+r) = \frac{30}{19}$ $a = \frac{30}{19(1+r)}$	 $\checkmark a + ar = \frac{30}{19}$ <p style="text-align: right;">(1)</p>
3.2.3	$S_\infty = \frac{a}{1-r} = \frac{54}{19}$ $\therefore a = \frac{54(1-r)}{19}$ $a = \frac{30}{19(1+r)} \dots \dots \dots \textit{from (3.2.2)}$ $\therefore \frac{30}{19(1+r)} = \frac{54(1-r)}{19}$ $(1-r)(1+r) = \frac{30}{54}$ $1-r^2 = \frac{5}{9}$ $r^2 = \frac{4}{9}$ $\therefore r = \frac{2}{3}$	$\checkmark a = \frac{54(1-r)}{19}$ $\checkmark \text{equating / ho le kanntsha}$ $\checkmark r^2 = \frac{4}{9}$ $\checkmark \text{answer / karabo}$ <p style="text-align: right;">(4)</p>
[9]		

QUESTION 4/ POTSO 4

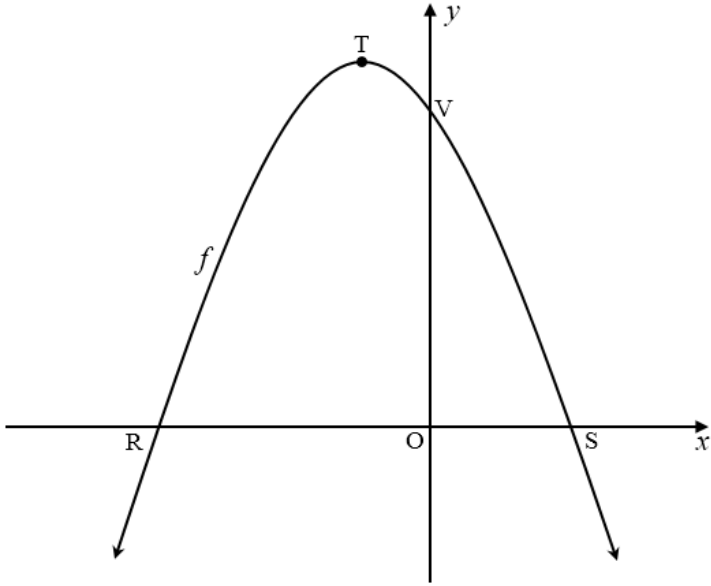



4.1	D(0 ; 1)	✓ (0 ; 1)	(1)
4.2	$x = -2$; $y = -1$	✓ $x = -2$ ✓ $y = -1$	(2)
4.3	$x \in \mathbb{R}$ but $x \neq -2$	✓ $x \in \mathbb{R}$ ✓ $x \neq -2$	(2)
4.4	$g(x) = b^x$ $8 = b^{-3}$ $8 = \frac{1}{b^3}$ $b^3 = \frac{1}{8}$ $\therefore b = \frac{1}{2}$	 ✓ substitution / <i>sabusitikhushini</i> ✓ answer / <i>karabo</i>	(2)
4.5	$y = \frac{-3}{x+2} - 1$ $0 = \frac{-3}{x+2} - 1$ $1 = \frac{-3}{x+2}$ $x+2 = -3$ $x = -5$ $\therefore A(-5; 0)$ $y = \frac{-3}{0+2} - 1$ $= -\frac{5}{2}$ $\therefore C(0; -\frac{5}{2})$	✓ substitution $y = 0$ / <i>sabusitikhushini</i> $y = 0$ ✓ $x = -5$ ✓ $y = -\frac{5}{2}$	(3)

4.6	$x = \left(\frac{1}{2}\right)^y$ $\therefore y = \log_{\frac{1}{2}} x$ <p style="text-align: center;">OR/KAPA</p> $y = 2^{-x}$ $\therefore x = 2^{-y}$ $y = -\log_2 x$	$\checkmark x = \left(\frac{1}{2}\right)^y$ $\checkmark y = \log_{\frac{1}{2}} x$ <p style="text-align: center;">OR/ KAPA</p> $\checkmark x = 2^{-y}$ $\checkmark y = -\log_2 x$ <p style="text-align: right;">(2)</p>
4.7.1	$-5 < x < -2$ OR/KAPA $x \in (-5 ; -2)$	$\checkmark\checkmark$ answer / karabo (A) (2)
4.7.2	$0 < x \leq \frac{1}{8}$ OR/KAPA $x \in (0 ; \frac{1}{8}]$	$\checkmark\checkmark$ answer / karabo (A) (2)
		[16]



QUESTION 5/POTSO 5


		
5.1	$-x^2 - 2x + 8 = 0$ $x^2 + 2x - 8 = 0$ $(x + 4)(x - 2) = 0$ $\therefore x = -4 \text{ or } x = 2$ $\therefore R(-4; 0) \text{ and } S(2; 0)$ $\therefore RS = 6 \text{ units}$ 	<ul style="list-style-type: none"> ✓ $f(x) = 0$ ✓ factorisation /fekithorisashini ✓ values of x / <i>velu tsa x</i> ✓ answer / <i>karabo</i> <p style="text-align: right;">(4)</p>

<p>5.2</p> $x = \frac{-4+2}{2}$ $= -1$ $y = -(-1)^2 - 2(-1) + 8$ $= 9$ $\therefore T(-1;9)$ <p style="text-align: center;">OR/KAPA</p> $f(x) = -x^2 - 2x + 8$ $x = -\frac{b}{2a}$ $= -\left(\frac{-2}{2(-1)}\right)$ $= -1$ $y = -(-1)^2 - 2(-1) + 8$ $= 9$ $\therefore T(-1;9)$ <p style="text-align: center;">OR/KAPA</p> $f'(x) = -2x - 2 = 0$ $-2x = 2$ $x = -1$ $y = -(-1)^2 - 2(-1) + 8$ $= 9$ $\therefore T(-1;9)$	<p>✓ method / <i>method</i></p> <p>✓ $x = -1$</p> <p>✓ $y = 9$</p> <p style="text-align: center;">OR/KAPA</p> <p>✓ $-\frac{b}{2a}$</p> <p>✓ $x = -1$</p> <p>✓ $y = 9$</p> <p style="text-align: center;">OR/KAPA</p> <p>✓ $-2x - 2 = 0$</p> <p>✓ $x = -1$ ✓ $y = 9$</p> <p style="text-align: right;">(3)</p>
<p>5.3.1</p> $f(x) = -x^2 - 2x + 8$ $f'(x) = -2x - 2$ $\therefore -2x - 2 = 2$ $\therefore x = -2$ $\therefore y = -(-2)^2 - 2(-2) + 8$ $= 8$ $\therefore W(-2;8)$	<p>✓ $f'(x)$</p> <p>✓ $f'(x) = 2$</p> <p>✓ $x = -2$</p> <p>✓ $y = 8$</p> <p style="text-align: right;">(4)</p>
<p>5.3.2</p>	$g(x) = mx + c$ $m = -\frac{1}{2} (\perp \text{ lines})$ $c = 8$ $\therefore y = -\frac{1}{2}x + 8$ <p>✓ gradient / <i>keratiente</i></p> <p>✓ equation / <i>ekweishini</i></p> <p style="text-align: right;">(2)</p>

5.4	$f(x) = -x^2 - 2x + 8$ $h(x) = -f(x-1)$ $= -[-(x-1)^2 - 2(x-1) + 8]$ $= -[-(x^2 - 2x + 1) - 2x + 2 + 8]$ $= -[-x^2 + 2x - 1 - 2x + 2 + 8]$ $= x^2 - 9$ <p style="text-align: center;">OR/KAPA</p> $h(x) = (x+3)(x-3)$ $= x^2 - 9$ <p style="text-align: center;">OR/KAPA</p> <p>New turning point / <i>theneng pointe entjha</i> = (0 ; -9)</p> $y = x^2 - 9$	$\checkmark -f(x-1)$ $\checkmark \text{ substitution / } \textit{sabosititshushini}$ $\checkmark \text{ simplifying /}$ $\checkmark \text{ equation / } \textit{ekweshini}$ <p style="text-align: center;">OR/KAPA</p> $\checkmark \checkmark \text{ roots/ } \textit{di ruthi 3 and/le-3}$ $\checkmark +(x+3)(x-3)$ $\checkmark \text{ equation / } \textit{ekweshini}$ <p style="text-align: center;">OR/KAPA</p> $\checkmark (0 ; \checkmark \checkmark -9)$ $\checkmark \text{ equation / } \textit{ekweshini}$ <p style="text-align: right;">(4)</p>
		[17]

QUESTION 6/ POTSO 6

6.1	$A = P(1-i)^n$ $5510 = 9670(1-i)^4$ $\therefore i = 1 - \sqrt[4]{\frac{5510}{9670}}$ $= 0,131177$ $\therefore r = 13,12\%$	$\checkmark \text{ subst. into correct formula } \textit{Sabosit ho moralo o nepahetseng}$ $\checkmark \text{ simplification } \textit{Ho nolofatsa}$ $\checkmark \text{ answer / } \textit{karabo}$ <p style="text-align: right;">(3)</p>
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<p>6.2</p>	<p>End of December</p> $F = \frac{x[(1+i)^n - 1]}{i}$ $\therefore F = \frac{600 \left[\left(1 + \frac{0,087}{12}\right)^{144} - 1 \right]}{\frac{0,087}{12}}$ <p>= R151 438,20 End of January</p> $A = P(1+i)^n$ $= 151\,438,20 \left(1 + \frac{0,087}{12}\right)$ $= R152\,536,13$ <p style="text-align: center;">OR/KAPA</p> $F = \frac{x[(1+i)^n - 1](1+i)}{i}$ $\therefore F = \frac{600 \left[\left(1 + \frac{0,087}{12}\right)^{144} - 1 \right] \left(1 + \frac{0,087}{12}\right)}{\frac{0,087}{12}}$ $= R152\,536,13$ <div style="text-align: center;">  </div>	<p>✓ $n = 144$ ✓ subst. into correct formula <i>Sabust ho moralo o nepahetseng</i></p> <p>✓ adding final month's interest <i>Aketsa tswala ya kgwedi ya ho qetela</i> ✓ answer / karabo</p> <p style="text-align: center;">OR/KAPA</p> <p>✓ $n = 144$ ✓ subst. into correct formula <i>Sabost. ho moralo o nepahetseng</i> ✓ adding final month's interest <i>Aketsa tswala ya kgwedi ya ho qetela</i> ✓ answer / karabo</p> <p style="text-align: right;">(4)</p>
<p>6.3.1</p>	$P = \frac{x[1 - (1+i)^{-n}]}{i}$ $350\,000 = \frac{x \left[1 - \left(1 + \frac{0,093}{12}\right)^{-72} \right]}{\frac{0,093}{12}}$ $\therefore x = \frac{350\,000 \times \frac{0,093}{12}}{\left[1 - \left(1 + \frac{0,093}{12}\right)^{-72} \right]}$ $\therefore x \approx R6\,361,18$	<p>✓ $i = \frac{0,093}{12}$ and $n = 72$ ✓ substitution into correct formula <i>Sabusititshushini ho moralo o nepahetseng</i></p> <p>✓ answer /karabo</p> <p style="text-align: right;">(3)</p>

6.3.2

Outstanding balance =

$$P = \frac{x[1 - (1 + i)^{-n}]}{i}$$

$$\therefore P = \frac{6\,361,18 \left[1 - \left(1 + \frac{0,093}{12} \right)^{-32} \right]}{\frac{0,093}{12}}$$

$$= R179\,667,32$$

OR/KAPA

Outstanding balance

= $A - F$

$$= 350\,000 \left(1 + \frac{0,093}{100} \right)^{40} - \frac{6\,361,18 \left[\left(1 + \frac{0,093}{12} \right)^{40} - 1 \right]}{\frac{0,093}{12}}$$

$$= R476\,628,84 - R296\,961,79$$

$$= R179\,667,05$$



$$\checkmark i = \frac{0,093}{12} \text{ and } = 32$$

✓ subst. into correct formula
sabosit ho moralo o nepahetseng

$$\checkmark P = 179\,667,32$$

(3)

OR/KAPA

$$\checkmark i = \frac{0,093}{12} \text{ and } = 40$$

✓ subst. Into correct formula
Sabosit. Ho moralo o nepahetseng

$$\checkmark P = 179\,667,32$$

(3)

6.3.3

$$\therefore 179\,667,32 = \frac{7\,000 \left[1 - \left(1 + \frac{0,093}{12} \right)^{-n} \right]}{\frac{0,093}{12}}$$

$$\frac{179\,667,32 \times \frac{0,093}{12}}{7\,000} - 1 = - \left(1 + \frac{0,093}{12} \right)^{-n}$$

$$-0,80108\dots = - \left(\frac{4\,031}{4\,000} \right)^{-n}$$

$$\therefore 0,80108\dots = \frac{4\,031^{-n}}{4\,000}$$

$$\therefore -n = \frac{\log 0,80108\dots}{\log \frac{4\,031}{4\,000}}$$

$$-n \approx -28,73$$

$$\therefore n \approx 28,73$$

\therefore The number of months is 29.

Le nani la dikgwedi ke 29.

OR/KAPA

$$179\,667,32 = \frac{7\,000 \left[1 - \left(1 + \frac{0,093}{12} \right)^{-n} \right]}{\frac{0,093}{12}}$$

$$\frac{179\,667,32 \times \frac{0,093}{12}}{7\,000} - 1 = - \left(1 + \frac{0,093}{12} \right)^{-n}$$

$$-0,80108\dots = - \left(\frac{4\,031}{4\,000} \right)^{-n}$$

$$\therefore 0,80108\dots = \frac{4\,031^{-n}}{4\,000}$$

$$\therefore -n = \frac{\log 0,80108\dots}{\log \frac{4\,031}{4\,000}}$$

$$-n \approx -28,73$$

$$\therefore n \approx 28,73$$

\therefore The number of months is 29.

Le nani la dikgwedi 29



✓ subst. into correct formula
Sabositi. Ho moralo o nepahetseng

✓ correct use of logs
Tsela e nepahetseng ya ho sebedisa dilogo

✓ = 28,73

✓ $n = 29$ months /dikgwedi

OR/KAPA

✓ subst. into correct formula
Sabosit. Ho moralo o nepahetseng

✓ correct use of logs

Tsela e nepahetseng ya ho sebedisa di logo

✓ = 28,73

✓ $n = 29$ months / kgwedi

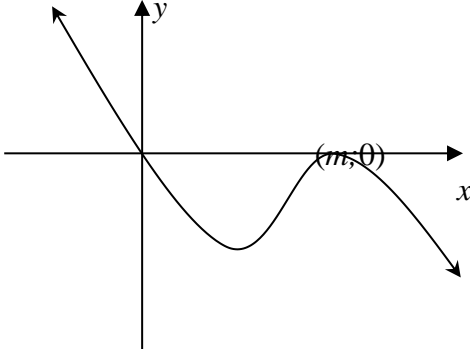
(4)

[17]

QUESTION 7/ POTOSO 7

7.1	$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{5 - 2(x+h)^2 - (5 - 2x^2)}{h}$ $= \lim_{h \rightarrow 0} \frac{5 - 2x^2 - 4xh - 2h^2 - 5 + 2x^2}{h}$ $= \lim_{h \rightarrow 0} \frac{-4xh - 2h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-4x - 2h)}{h}$ $= \lim_{h \rightarrow 0} (-4x - 2h)$ $= -4x$	<ul style="list-style-type: none"> ✓ substitution / <i>sabosititshushini</i> ✓ expansion / <i>ho oketsa</i> ✓ simplification / <i>ho nolofatsha</i> ✓ notation and $\lim_{h \rightarrow 0} (-4x - 2h)$ ✓ answer / <i>karabo</i> <p style="text-align: right;">(5)</p>
7.2.1	$y = 7x^4 + \frac{2x^2}{\sqrt{x}}$ $= 7x^4 + 2x^{\frac{3}{2}}$ $\therefore \frac{dy}{dx} = 28x^3 + 3x^{\frac{1}{2}}$	<ul style="list-style-type: none"> ✓ $2x^{\frac{3}{2}}$ ✓ $28x^3$ ✓ $3x^{\frac{1}{2}}$ <p style="text-align: right;">(3)</p>
7.2.2	$= D_x \left[\frac{3x^2 - 7x - 6}{x} \right]$ $= D_x [3x - 7 - 6x^{-1}]$ $= 3 + 6x^{-2}$	<ul style="list-style-type: none"> ✓ $3x - 7$ ✓ $-6x^{-1}$ ✓ 3 and differentiating constant 3 le difarensiething konstant ✓ $+6x^{-2}$ <p style="text-align: right;">(4)</p>
		[12]

QUESTION 8/ POTOSO 8

<p>8.1.1</p>	$f(x) = 2(x - x_1)(x - x_2)(x - x_3)$ $= 2(x + 1)\left(x - \frac{1}{2}\right)(x - 3)$ $= (x + 1)(2x - 1)(x - 3)$ $= (x + 1)(2x^2 - 7x + 3)$ $= 2x^3 - 7x^2 + 3x + 2x^2 - 7x + 3$ $= 2x^3 - 5x^2 - 4x + 3$ $f(x) = 2x^3 + bx^2 + cx + d$ $\therefore b = -5, c = -4, d = 3$	<p>✓✓ $f(x) = 2(x + 1)\left(x - \frac{1}{2}\right)(x - 3)$</p> <p>OR/KAPA</p> <p>✓✓ $f(x) = (x + 1)(2x - 1)(x - 3)$</p> <p>✓ expansion / ho oketsa</p> <p>✓ simplifying / ho etsa bobebe</p> <p>(4)</p>
<p>8.1.2</p>	$f'(x) = 6x^2 - 10x - 4$ $0 = 6x^2 - 10x - 4$ $\therefore 3x^2 - 5x - 2 = 0$ $(3x + 1)(x - 2) = 0$ $\therefore x = -\frac{1}{3} \text{ or / of } x = 2$ $\therefore N \text{ is at } f(2)$ $f(2) = 2(2)^3 - 5(2)^2 - 4(2) + 3$ $= -9$ $\therefore N(2; -9)$	<p>✓ $f'(x) = 6x^2 - 10x - 4 = 0$</p> <p>✓ factorisation / fekithorisashini</p> <p>✓ chosing/ho kgetha : $x = 2$</p> <p>✓ $y = -9$</p> <p>(4)</p>
<p>8.1.3 (a)</p>	<p>$-\frac{1}{3} < x < 2$</p>	<p>✓✓ answer / karabo</p> <p>(2)</p>
<p>8.1.3 (b)</p>	$f''(x) = 12x - 10$ $12x - 10 < 0$ $12x < 10$ $\therefore x < \frac{5}{6}$ <p>OR/KAPA</p> $x = \frac{-\frac{1}{3} + 2}{2} = \frac{5}{6}$ $\therefore x < \frac{5}{6}$	<p>✓ $f''(x) = 12x - 10$</p> <p>✓ $f''(x) < 0$</p> <p>✓ answer / karabo</p> <p>OR/KAPA</p> <p>✓ $x = \frac{5}{6}$</p> <p>✓✓ $x < \frac{5}{6}$ OR/KAPA $x \in \left(-\infty; \frac{5}{6}\right)$</p> <p>(3)</p>
<p>8.2</p>		<p>✓ $f(0) = 0$</p> <p>✓ $(m; 0)$</p> <p>✓ shape / seemo</p> <p>(3)</p>
<p style="text-align: right;">[16]</p>		

QUESTION 9/VRAAG 9

9.1	$A = \left(\frac{1}{2} \times 15x \times 8x \times 2\right) + (15xy) + (8xy) + (17xy)$ $5760 = 120x^2 + 40xy$ $\therefore y = \frac{5760 - 120x^2}{40x}$	✓ total surface area / <i>Totale safeisi eria</i> ✓ $5760 = 120x^2 + 40xy$ (2)
9.2	$V = \left(\frac{1}{2}bh\right) \times H$ $V = \frac{1}{2} \times 15x \times 8x \times y$ $= \frac{1}{2} \times 15x \times 8x \times \frac{5760 - 120x^2}{40x}$ $= 60x(144 - 3x^2)$ $= 8640x - 180x^3$	✓ substitution into V <i>Sabosititshushioni ho V</i> ✓ substituing for y <i>Sabositikhushini ya y</i> (2)
9.2	$V'(x) = 8640 - 540x^2$ $V'(x) = 0$ $\therefore 8640 - 540x^2 = 0$ $8640 = 540x^2$ $x^2 = 16$ $\therefore x = 4$	✓ $V'(x) = 8640 - 540x^2$ ✓ $V'(x) = 0$ ✓ simplification / <i>Ho nolofatsa</i> ✓ answer / <i>karabo</i> (4)
		[8]



QUESTION 11/POTSO 11

11.1	<p>@@@ ###</p> $\boxed{20} \times \boxed{22} \times \boxed{21} \times \boxed{10} \times \boxed{10} \times \boxed{10}$ $= 9\,240\,000$	<p>✓ $\boxed{20} \times \boxed{22} \times \boxed{21}$ ✓ $\boxed{10} \times \boxed{10} \times \boxed{10}$ ✓ answer / karabo</p> <p style="text-align: right;">(3)</p>
11.2	$\frac{\boxed{20} \times \boxed{19} \times \boxed{3} \times \boxed{10} \times \boxed{10} \times \boxed{5} + \boxed{20} \times \boxed{3} \times \boxed{19} \times \boxed{10} \times \boxed{10} \times \boxed{5}}{9\,240\,000}$ $= \frac{1140\,000}{9\,240\,000}$ $= \frac{19}{154} \quad \text{or / of} \quad 0,12 \quad \text{or / of} \quad 12,34\%$	<p>✓ $\boxed{20} \times \boxed{19} \times \boxed{3} \times \boxed{10} \times \boxed{10} \times \boxed{5}$ ✓ $\boxed{20} \times \boxed{3} \times \boxed{19} \times \boxed{10} \times \boxed{10} \times \boxed{5}$ ✓ adding / ho aketsa ✓ 9 240 000 ✓ answer / karabo</p> <p style="text-align: right;">(5)</p>
		[8]

TOTAL/KAOFELA: 150

