KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS P1

JUNE EXAMINATION

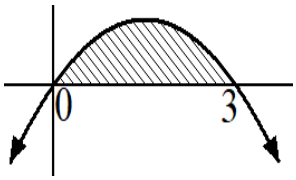
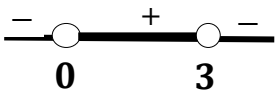
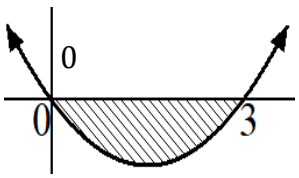
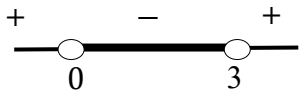
2025

MARKING GUIDELINES

MARKS: 100

These marking guidelines consist of 14 pages.

QUESTION 1

1.1.1	$(x-3)(2x+5)=0$ $x=3$ or $x=-\frac{5}{2}$	A✓ $x=3$ A✓ $x=-\frac{5}{2}$ (2)
1.1.2	$4(x-3)=-x^2$ $4x-12=-x^2$ $x^2+4x-12=0$ $(x+6)(x-2)=0$ $x=-6$ *or* $x=2$	A✓ standard form CA✓correct factors CA✓ both answers (3)
1.1.3	$3x^2+2x-4=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\frac{-(2)\pm\sqrt{(2)^2-4(3)(-4)}}{2(3)}$ $x=-1{,}54$ or $x=0{,}87$ **Penalise ONE mark for incorrect rounding**	A✓ correct substitution CA✓ answer CA✓ answer (3)
1.1.4	$-x^2+3x>0$ $-x(x-3)>0$ CV: $x=0$ or $x=3$   $0<x<3$ **OR** $x\in(0\,;3)$ **OR** $-x^2+3x>0$ $x^2-3x<0$ $x(x-3)<0$ CV: $x=0$ or $x=3$   $0<x<3$ **OR** $x\in(0\,;3)$	A✓ correct factors CA✓ critical values (**accept critical values** if shown on a sketch or number line) CA✓✓ answer (4) **OR** A✓ correct factors CA✓ critical values (**accept critical values** if shown on a sketch or number line) CA✓✓ answer (4)

1.1.5	$(x^2+2)(x^2+2)-x^2-8=0$ $x^4+4x^2+4-x^2-8=0$ $x^4+3x^2-4=0$ $(x^2+4)(x^2-1)=0$ $x^2=-4$ or $x^2=1$ no solution or $x=\pm 1$ **OR** $(x^2+2)(x^2+2)-x^2-8=0$ $(x^2+2)(x^2+2)-x^2-2-6=0$ $(x^2+2)(x^2+2)-(x^2+2)-6=0$ $(x^2+2)^2-(x^2+2)-6=0$ $[(x^2+2)-3][(x^2+2)+2]=0$ $(x^2-1)(x^2+4)=0$ $x^2=1$ or $x^2=-4$ $x=\pm 1$ or no solution	A✓ multiplying: remove brackets CA✓ standard form CA✓ factors CA✓ rejecting $x^2=-4$ CA✓ both values of x (5) **OR** A✓ splitting –8 CA✓ standard form CA✓ factors CA✓ both values of x CA✓ rejecting $x^2=-4$ (5)
1.2	$y=1+2x$ $3x^2-5xy-24=-4y^2$ $3x^2-5x(1+2x)-24=-4(1+2x)^2$ $3x^2-5x-10x^2-24=-4(1+4x+4x^2)$ $-7x^2-5x-24=-4-16x-16x^2$ $9x^2+11x-20=0$ $(9x+20)(x-1)=0$ $x=-\frac{20}{9}$ or $x=1$ $y=1+2\left(-\frac{20}{9}\right)$ or $y=1+2(1)$ $y=-\frac{31}{9}$ or $y=3$ **OR**	A✓ rewriting equation as $y=....$ CA✓ substituting $y=1+2x$ into quadratic equation CA✓ standard form CA✓ factors CA✓ both values of x CA✓ both values of y (6) **OR**

	$y=1+2x$ $x=\frac{y-1}{2}$	A✓ rewriting equation as $x=....$
	$3x^2-5xy-24=-4y^2$ $3\left(\frac{y-1}{2}\right)^2-5\left(\frac{y-1}{2}\right)y-24=-4y^2$ $3\left(\frac{y^2-2y+1}{4}\right)-5y\left(\frac{y-1}{2}\right)-24=-4y^2$ $\frac{3}{4}\left(y^2-2y+1\right)-\frac{5}{2}y\left(y-1\right)=24-4y^2$ $3y^2-6y+3-10y^2+10y-96+16y^2=0$	CA✓ substituting $x=\frac{y-1}{2}$ into quadratic equation
	$9y^2+4y-93=0$	CA✓ standard form
	$\left(9y+31\right)\left(y-3\right)=0$	CA✓ factors
	$y=-\frac{31}{9}$ or $y=3$	CA✓ both values of y
	$x=\frac{\left(-\frac{31}{9}\right)-1}{2}$ or $x=\frac{(3)-1}{2}$ $x=-\frac{20}{9}$ or $x=1$	CA✓ both values of x (6)
1.3	$m+n+p=0$ $p=-m-n$	✓A rewriting $p=$
	$mx^2+nx+p=0$ $mx^2+nx-m-n=0$	
	$x=\frac{-n\pm\sqrt{n^2-4(m)(-m-n)}}{2m}$ $=\frac{-n\pm\sqrt{n^2+4mn+4m^2}}{2m}$	✓A substitution into quadratic formula
	$=\frac{-n\pm\sqrt{(n+2m)^2}}{2m}$ $x=\frac{-n+(n+2m)}{2m}$ *or* $x=\frac{-n-(n+2m)}{2m}$ $x=\frac{2m}{2m}$ $x=\frac{-2n-2m}{2m}$ $x=1$ $x=\frac{-n-m}{m}=\frac{p}{m}$	✓A simplification ✓A both answers (4)
	OR	

$m+n+p=0$

$n=-m-p$ ✓A rewriting $n=$

$mx^2+nx+p=0$

$mx^2+(-m-p)x+p=0$

$x=\dfrac{-(-m-p)\pm\sqrt{(-m-p)^2-4(m)(p)}}{2m}$ ✓A substitution into quadratic formula

$=\dfrac{(m+p)\pm\sqrt{m^2-2mp+p^2}}{2m}$

$=\dfrac{(m+p)\pm\sqrt{(m-p)^2}}{2m}$ ✓A simplification

$x=\dfrac{(m+p)+(m-p)}{2m}$ *or* $x=\dfrac{(m+p)-(m-p)}{2m}$

$x=\dfrac{2m}{2m}$ $x=\dfrac{2p}{2m}$

$x=1$ $x=\dfrac{p}{m}$ ✓A both answers (4)

OR

$m+n+p=0$

$m=-n-p$ ✓A rewriting $m=$

$mx^2+nx+p=0$

$(-n-p)x^2+nx+p=0$

$x=\dfrac{-(n)\pm\sqrt{(n)^2-4(-n-p)(p)}}{2(-n-p)}$ ✓A substitution into quadratic formula

$=\dfrac{-n\pm\sqrt{n^2+4np+4p^2}}{2(-n-p)}$

$=\dfrac{-n\pm\sqrt{(n+2p)^2}}{2(-n-p)}$ ✓A simplification

$x=\dfrac{-n+(n+2p)}{2(-n-p)}$ *or* $x=\dfrac{-n-(n+2p)}{2(-n-p)}$

$x=\dfrac{2p}{2m}$ $x=\dfrac{-2n-2p}{-2n-2p}$

$x=\dfrac{p}{m}$ $x=1$ ✓A both answers (4)

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QUESTION 2

2.1.1	$\frac{6^{n+2}.12^n}{72^n}$ $=\frac{(3.2)^{n+2}.(2^2.3)^n}{(2^3.3^2)^n}$ $=\frac{3^{n+2}.2^{n+2}.2^{2n}.3^n}{2^{3n}.3^{2n}}$ $=3^{n+2+n-2n}.2^{n+2+2n-3n}$ $=3^2.2^2$ $=9.4$ $=36$ **OR** $\frac{6^{n+2}.12^n}{72^n}$ $=\frac{6^{n+2}.12^n}{(6.12)^n}$ $=\frac{6^{n+2}.12^n}{6^n.12^n}$ $=6^{n+2-n}$ $=6^2$ $=36$	A✓ rewriting with prime bases CA✓ simplifying using exponent laws CA✓ answer (3) **OR** A✓ rewriting with the same bases CA✓ simplifying using exponent laws CA✓ answer (3)
2.1.2	$\sqrt{\left(\sqrt{13}-\sqrt[3]{-27}\right)\left(\sqrt{13}-\sqrt{9}\right)}$ $=\sqrt{\left(\sqrt{13}-(-3)\right)\left(\sqrt{13}-3\right)}$ $=\sqrt{\left(\sqrt{13}+3\right)\left(\sqrt{13}-3\right)}$ $=\sqrt{13-9}$ $=\sqrt{4}$ $=2$	A✓ (-3) A✓ 3 CA✓ $\sqrt{4}$ CA✓ answer (4)

2.2	$\frac{3.5^{x+2}-3.5^{x}}{-18.3^{-x}}$ $=\frac{3.5^{x}.5^{2}-3.5^{x}}{-18.3^{-x}}$ $=\frac{5^{x}\left(3.5^{2}-3\right)}{-18.3^{-x}}$ **OR** $=\frac{3.5^{x}\left(5^{2}-1\right)}{-18.3^{-x}}$ $=\frac{5^{x}(72)}{-18.3^{-x}}$ **OR** $=\frac{3^{x}.5^{x}(24)}{-6}$ $=\frac{5^{x}(-4)}{3^{-x}}$ $=-4.5^{x}3^{x}$ **OR** $=3^{x}.5^{x}.-4$ $=-4.(5.3)^{x}$ $=-4.15^{x}$ $=-4m$	A✓ common factor of $5^{x}\left(3.5^{2}-3\right)$ **OR** $3.5^{x}\left(5^{2}-1\right)$ A✓ $-4.5^{x}3^{x}$ A✓ answer (3)
2.3.1	$\sqrt[3]{\left(\frac{81}{x}\right)^{-2}}=\frac{1}{9}$ $\left(\frac{81}{x}\right)^{-\frac{2}{3}}=3^{-2}$ $\left(\frac{81}{x}\right)^{-\frac{2}{3}\times\left(-\frac{3}{2}\right)}=3^{-2\times\left(-\frac{3}{2}\right)}$ $\frac{81}{x}=3^{3}$ $x=\frac{3^{4}}{3^{3}}$ $x=3$ **OR** $\sqrt[3]{\left(\frac{81}{x}\right)^{-2}}=\frac{1}{9}$ $\left(\frac{81}{x}\right)^{-\frac{2}{3}}=3^{-2}$ $\left(\frac{81}{x}\right)^{-\frac{2}{3}}=\left(3^{3}\right)^{-\frac{2}{3}}$ $\frac{81}{x}=27$ $27x=81$ $x=3$	A✓ $\left(\frac{81}{x}\right)^{-\frac{2}{3}}$ A✓ 3^{-2} CA✓ × reciprocal on exponents CA✓ answer (4) **OR** A✓ $\left(\frac{81}{x}\right)^{-\frac{2}{3}}$ A✓ $\left(3^{3}\right)^{-\frac{2}{3}}$ CA✓ equating bases CA✓ answer (4)

2.3.2	$\sqrt{x-2}=x-4$ $\left(\sqrt{x-2}\right)^2=(x-4)^2$ $x-2=x^2-8x+16$ $x^2-8x-x+16+2=0$ $x^2-9x+18=0$ $(x-6)(x-3)=0$ $x=6$ or $x\neq 3$	A✓ squaring both sides CA✓ standard form CA✓ factors CA✓ answers with rejection (4)
2.3.3	$\frac{5^{x+1}-5^x}{5^{2x+1}-25^x}=125$ $\frac{5^x.5-5^x}{5^{2x}.5-5^{2x}}=5^3$ $\frac{5^x\left(5^1-1\right)}{5^{2x}\left(5^1-1\right)}=5^3$ $5^{-x}=5^3$ $-x=3$ $x=-3$	 A✓ rewriting with base 5 CA✓ common factor in both numerator and denominator CA✓ $5^{-x}=5^3$ CA✓ answer (4)

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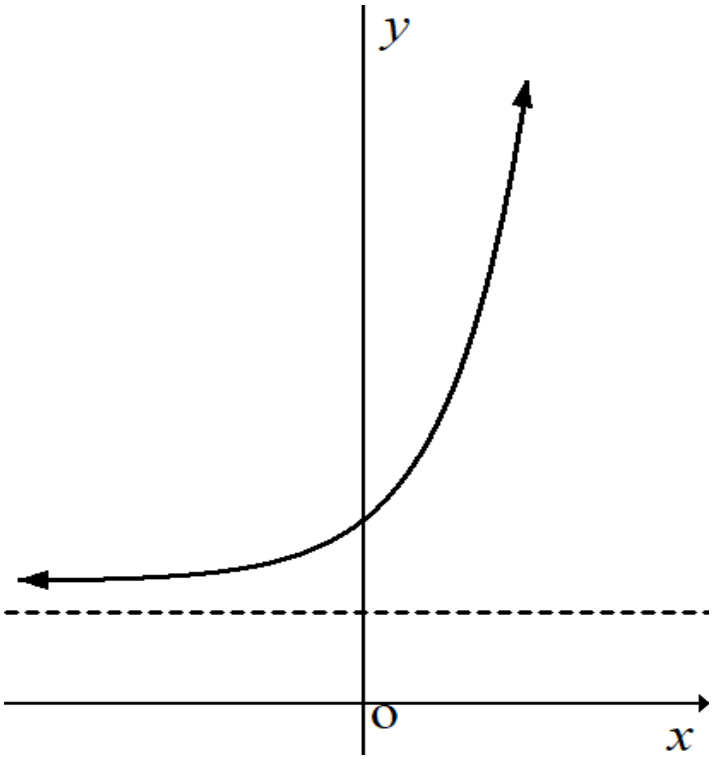
QUESTION 3

3.1.1	$y=-9$	A✓ answer (1)
3.1.2	$f(x)=3^{-x+1}-9$ $0=3^{-x+1}-9$ $9=3^{-x+1}$ $3^2=3^{-x+1}$ $2=-x+1$ $x=-1$ $\text{A}(-1;0)$	A✓ $f(x)=0$ **OR** subst $y=0$ CA✓ $3^2=3^{-x+1}$ CA✓ value of x (3)
3.1.3	$f(0)=3^{-0+1}-9$ $=-6$ $\text{B}(0;-6)$	A✓ $f(0)$ **OR** subst $x=0$ CA✓ value of y (2)
3.1.4	$p(x)=\left(3^{-x+1}-9\right)+6$ $p(x)=3^{-x+1}-3$	A✓ answer (1)
3.1.5	$k>-6$ **OR** $k\in(-6;\infty)$	A✓ answer (1) **OR** A✓ answer (1)
3.1.6	$f(x)=3^{-x+1}-9$ $q(x)=3^{-x+3}-9$ $=3^{-(x-2)+1}-9$ $\therefore$ tanslation of 2 units to the right **OR** $f(x)=\frac{1}{3^{x-1}}-9$ $q(x)=\frac{1}{3^{x-3}}-9$ $=\frac{1}{3^{(x-2)-1}}-9$ $\therefore$ tanslation of 2 units to the right	A✓ simplified equation of q CA✓ answer (2) **OR** A✓ simplified equation of f CA✓ answer (2)

3.2		A✓ positive $y-$asymptote A✓ positive $y-$intercept A✓ g is increasing above the asymptote (3)

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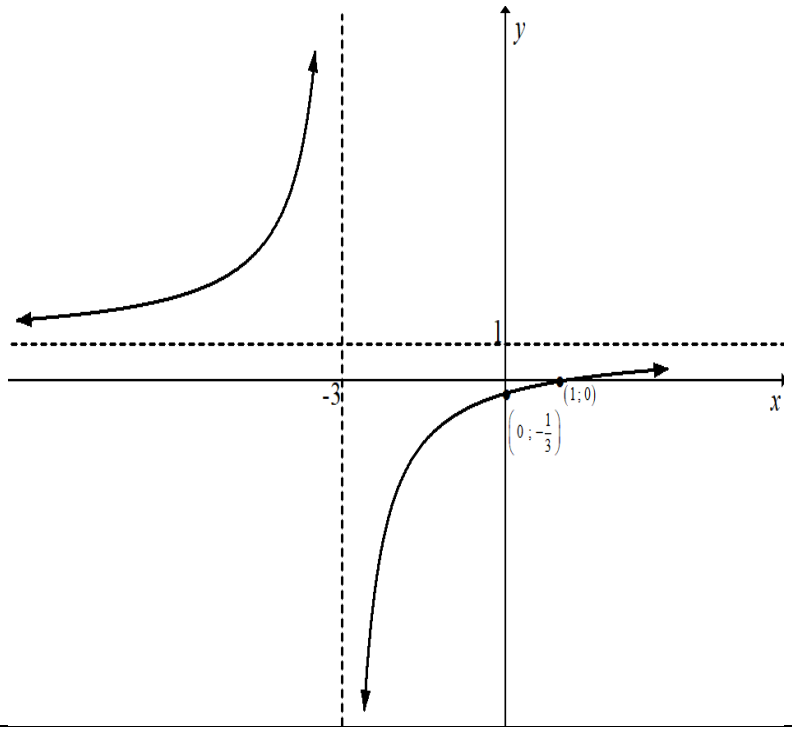
QUESTION 4

4.1	$x+4=-x-2$ $\frac{2x}{2}=\frac{-6}{2}$ $x=-3$ $y=1$	A✓ equating both equations CA✓ equation of vertical asymptote CA✓ equation of horizontal asymptote (3)
4.2	$g(x)=\frac{a}{x+p}+q$ $g(x)=\frac{a}{x+3}+1$ $2=\frac{a}{-7+3}+1$ $1=\frac{a}{-4}$ $a=-4$ $\therefore g(x)=\frac{-4}{x+3}+1$	 A✓ subst. values of p and q A✓ substituting $(-7\,;2)$ A✓ value of a (3)
4.3	$g(x)=\frac{-4}{x+3}+1$ $0=\frac{-4}{x+3}+1$ $-1=\frac{-4}{x+3}$ $-(x+3)=-4$ $-x-3=-4$ $-x=-1$ $x=1$	 A✓ substitution of $g(x)=0$ CA✓ simplification CA✓ answer (3)
4.4	$g(0)=\frac{-4}{0+3}+1$ $=-\frac{1}{3}$	A✓ substitution of $g(0)$ CA✓ answer (2)

4.5		A✓ asymptotes CA✓ intercepts with axes CA✓ shape (3)
4.6	$x \in \mathrm{R}\ ; x \neq 4$ **OR** $x \in (-\infty\ ; 4) \cup (4\ ; \infty)$ **OR** $x < 4$ or $x > 4$	A✓✓ answer (2) **OR** A✓✓ answer (2) **OR** A✓✓ answer (2)
4.7	$m(x) = \frac{-4}{x+3-7} + 1 + 2$ x-intercept of m: $0 = \frac{-4}{x-4} + 3$ $\frac{4}{x-4} = 3$ $x - 4 = \frac{4}{3}$ $x = \frac{16}{3}$ Domain of m: $x < 4$ or $x \geq \frac{16}{3}$ **OR** Domain of m: $x \in (-\infty\ ; 4\ ) \cup \left[\ \frac{16}{3}\ ; \infty\right)$	CA✓✓ answer (2) **OR** CA✓✓ answer (2)

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QUESTION 5

5.1.1	$h(x)=(x-3)^2+q$ $13=(0-3)^2+q$ $13=9+q$ $q=4$ **OR** $h(x)=(x-3)^2+q$ $20=(-1-3)^2+q$ $20=16+q$ $q=4$	A✓ substitution of $(0\,;13)$ CA✓ answer (2) **OR** A✓ substitution of $(-1\,;20)$ CA✓ answer (2)
5.1.2	$y\geq 4\,;y\in\mathrm{R}$ **OR** $y\in[4\,;\infty)$	CA✓ answer (1) **OR** CA✓ answer (1)
5.1.3	$x=3$	A✓ answer (1)
5.1.4	$m=\frac{4-13}{3-0}$ $m=-3$ $\therefore y=-3x+13$ **OR** $y=mx+13$ $4=m(3)+13$ $-9=3m$ $m=-3$ $\therefore y=-3x+13$	A✓ substituting points into grad. formula CA✓ gradient of k CA✓ answer (3) **OR** A✓ substituting point CA✓ gradient of k CA✓ answer (3)
5.1.5(a)	$0<x<3$ **OR** $x\in(0\,;3)$	A✓✓ answer (2) **OR** A✓✓ answer (2)
5.1.5(b)	$y=-3x+13$ $0=-3x+13$ $x=\frac{13}{3}$ $\therefore x\leq \frac{13}{3}$ **OR** $x\in\left(-\infty\,;\frac{13}{3}\right]$	CA ✓ $x-$intercept of k CA✓answer (2)

5.1.6	$x^2-6x+13=-2x+t$ $x^2-4x+13-t=0$ $(-4)^2-4(1)(13-t)<0$ $16-52+4t<0$ $4t<36$ $t<9$	A✓ equating ✓CA calculating Δ ✓A $\Delta<0$ ✓CA answer (4)
5.2	$h(t)=-5t^2+13t+6$ $t=\frac{-13}{2(-5)}$ $t=\frac{13}{10}$ $h\left(\frac{13}{10}\right)=-5\left(\frac{13}{10}\right)^2+13\left(\frac{13}{10}\right)+6$ $h\left(\frac{13}{10}\right)=\frac{289}{20}$ or $14\frac{9}{20}$ or $14,45\ m$ NO. The maximum height that the arrow reaches is below the height at which the eagle is flying **OR** $h(t)=14\frac{1}{2}m$ $-5t^2+13t+6=14\frac{1}{2}$ $-5t^2+13t-\frac{17}{2}=0$ $\Delta=b^2-4ac$ $\Delta=(13)^2-4(-5)\left(-\frac{17}{2}\right)$ $\Delta=-1$ NO he won't be able to hit the eagle because the eagle's path does NOT meet the arrow's path **OR** $-5t^2+13t+6=14\frac{1}{2}$ $5t^2-13t+\frac{17}{2}=0$ $t=\frac{-(-13)\pm\sqrt{(-13)^2-4(5)\left(+\frac{17}{2}\right)}}{2(5)}$ no solution for t NO, he won't be able to hit the eagle because the eagle's path does NOT intersect the path of the arrow	A✓ subst. into the axis of symmetry CA✓ substituting into the original equation CA✓ maximum height CA✓ NO CA✓ reason (5) **OR** A✓ equating h to $14\frac{1}{2}$ CA✓ standard form CA✓ value of Δ CA✓ NO CA✓ reason (5) **OR** A✓ equating h to $14\frac{1}{2}$ CA✓ standard form CA✓ solution of equation CA✓ NO CA✓ reason (5)

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TOTAL MARK : 100