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KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS P1

COMMON TEST

JUNE 2023

MARKING GUIDELINE

MARKS: 100

These marking guidelines consist of 8 pages.

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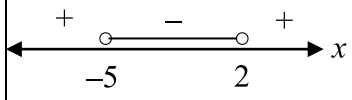
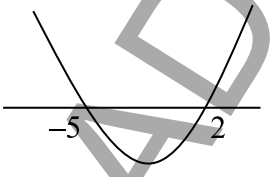
QUESTION 1

1.1.1	$\frac{12^{x-2}.2^{x+2}}{8^x.3^{x-4}}$ $=\frac{\left(2^2\times 3\right)^{x-2}.2^{x+2}}{\left(2^3\right)^x.3^{x-4}}$ $=\frac{2^{2x-4}.3^{x-2}.2^{x+2}}{2^{3x}.3^{x-4}}$ $=2^{-2}.3^2$ $=\frac{9}{4}$ or $=2\frac{1}{4}$	✓ prime bases ✓ application of law: $\times$ exponents ✓ application of laws: adding & subtracting exponents ✓ answer (4)
1.1.2	$\frac{\sqrt{3}(\sqrt{3}+\sqrt{6})-\sqrt{50}-3(3^0)}{\sqrt{8}}$ $=\frac{3+\sqrt{18}-\sqrt{50}-3(1)}{\sqrt{8}}$ $=\frac{3+\sqrt{9\times 2}-\sqrt{25\times 2}-3}{\sqrt{4\times 2}}$ $=\frac{3\sqrt{2}-5\sqrt{2}}{2\sqrt{2}}$ $=\frac{-2\sqrt{2}}{2\sqrt{2}}$ $=-1$	✓ $\sqrt{3}(\sqrt{3}+\sqrt{6})=3+\sqrt{18}$ ✓ $3^0=1$ ✓ simplifying surds ✓ subtracting surds ✓ answer (5)
1.2.1	$2^x+2^{x+2}=-5y+10$ $2^x(1+2^2)=-5y+10$ $5\left(2^x\right)=-5y+10$ $2^x=-y+2$	✓common factor ✓ 5 ✓ answer (3)
1.2.2	$2^x=\frac{-15}{8}+2$ $2^x=\frac{1}{8}$ $2^x=2^{-3}$ $\therefore x=-3$	✓ simplifying RHS ✓ bases the same ✓ answer (3)
		[15]

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QUESTION 2

2.1.1	$2x^2 = 7x$ $2x^2 - 7x = 0$ $x(2x-7) = 0$ $x = 0$ or $x = \frac{7}{2} = 3,5$	✓ standard form ✓ factors ✓ both x values (3)
2.1.2	$2x^2 - 5x - 8 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-8)}}{2(2)}$ $x = 3,61$ or $x = -1,11$ **NOTE:** Wrong formula: 0/3	✓ correct substitution into quadratic formula ✓ 3,61 ✓ $-1,11$ (3)
2.1.3	$x^2 + 3x - 10 < 0$ $(x+5)(x-2) < 0$  **OR**  $-5 < x < 2$ **OR** $x \in (-5\,;\,2)$	✓ factors ✓✓ answer **OR** ✓✓ answer (3)
2.1.4	$x - \sqrt{x+2} = 4$ $x - 4 = \sqrt{x+2}$ $x^2 - 8x + 16 = x + 2$ $x^2 - 9x + 14 = 0$ $(x-7)(x-2) = 0$ $x = 7$ or $x \neq 2$	✓ isolate the surd ✓ square both sides ✓ standard form ✓ factors ✓ answers with selection (5)
2.2	$2y - x = 1$ and $x^2 - 6y = 37$ $x = 2y - 1$ $(2y-1)^2 - 6y = 37$ $4y^2 - 4y + 1 - 6y = 37$ $4y^2 - 10y - 36 = 0$ $2y^2 - 5y - 18 = 0$ $(2y-9)(y+2) = 0$ $y = 4,5$ or $y = -2$ $x = 8$ or $x = -5$ **Note:** If learner makes a mistake which leads to both equations being LINEAR award maximum 3/6 marks ✓ $x = 2y - 1$ ✓ substitution ✓ first unknown	✓ $x = 2y - 1$ ✓ substitution ✓ standard form ✓ factors ✓ y-values ✓ x-values (6)
		[20]

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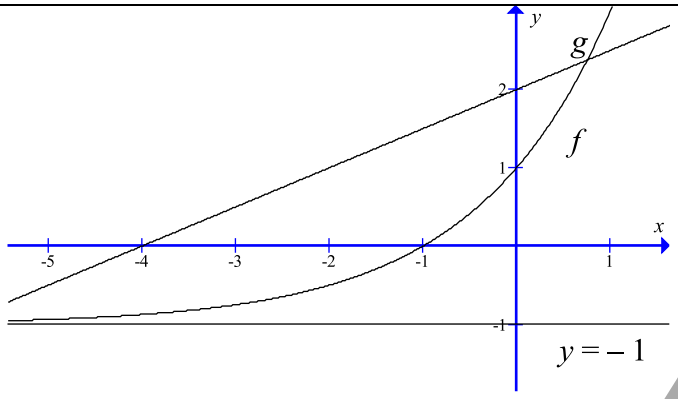
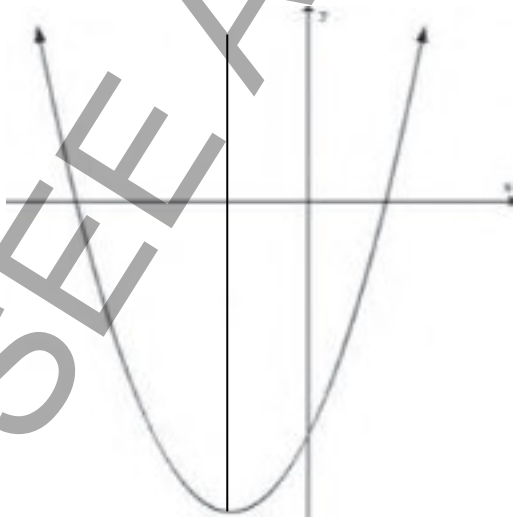
QUESTION 3

3.1.1	$x = \frac{-3 \pm \sqrt{-7m+3}}{4}$ $-7m+3=0$ $m = \frac{3}{7}$	✓ $-7m+3=0$ ✓ answer (2)
3.1.2	$-7m+3<0$ $m > \frac{3}{7}$ Answer only: full marks	✓ $-7m+3<0$ ✓ answer (2)
3.2.1	The equation is **undefined** at $x = 3$ or $x = -3$	✓ undefined (1)
3.2.2	$\frac{1}{x+3}-1=\frac{2x}{3-x}$ $\frac{1}{x+3}-1=-\frac{2x}{x-3}$ $x-3-(x+3)(x-3)=-2x(x+3)$ $x-3-x^2+9=-2x^2-6x$ $x^2+7x+6=0$ $(x+1)(x+6)=0$ $x=-1$ or $x=-6$	✓ change of sign ✓ multiplying by LCD ✓ removing brackets ✓ standard form ✓ factors ✓ answers (6)
3.3.1	$m+n=3(m-n)$ $m+n=3m-3n$ $4n=2m$ $m=2n$	✓ LHS of equation ✓ RHS of equation ✓ simplification (3)
3.3.2	$\frac{5mn}{m^2+n^2}=\frac{5(2n)(n)}{(2n)^2+n^2}$ $=\frac{10n^2}{5n^2}$ $=2$	✓ substitution of $m = 2n$ ✓ answer (2)
		[16]

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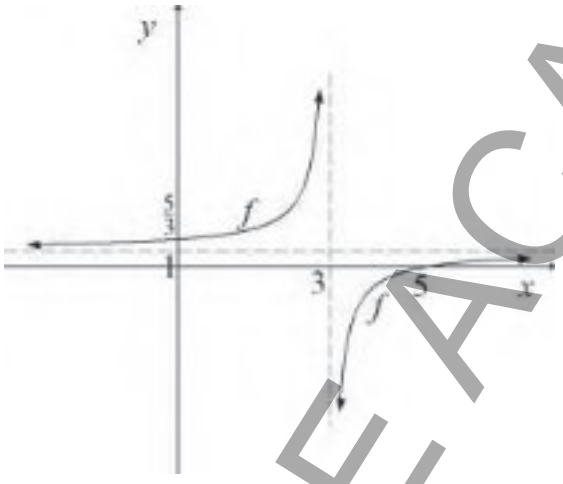
QUESTION 4

4.1.1	$y = -1$	✓ answer (1)
4.1.2		Graph of f ✓ x-intercept of -4 ✓ y-intercept of 2 Graph of g ✓ x-intercept of -1 ✓ y-intercept of 1 ✓ horizontal asymptote and shape (5)
4.1.3	$-4 < x < -1$ **OR** $x \in (-4\,;-1)$	✓ ✓ answer (2) ✓ ✓ answer (2)
4.2		✓shape: $a > 0$ ✓ turning point on LHS of y-axis $b < 0$ ✓ y-int below x-axis: $c < 0$ ✓ 2 x-intercepts: one positive and one negative (4) **[12]**

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QUESTION 5

5.1	$y = \frac{-2}{0-3} + 1$ $= \frac{5}{3}$ $\left(0 ; \frac{5}{3}\right)$ Answer only: 2 marks	✓ let $x = 0$ ✓ answer (2)
5.2	$0 = \frac{-2}{x-3} + 1$ $\frac{-2}{x-3} = -1$ $-2 = -1(x-3)$ $-2 = -x+3$ $x = 5$ $(5 ; 0)$	✓ let $y = 0$ ✓ simplification ✓ answer (3)
5.3		✓ asymptotes ✓ x-intercept ✓ y-intercept ✓ shape (4)
5.4	$3 < x \leq 5$ **OR** $x \in (3 ; 5]$	✓✓ answer **OR** ✓✓ answer (2)

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5.5	$f(-2)=\frac{-2}{-2-3}+1$ $=\frac{7}{5}$ $f(1)=\frac{-2}{1-3}+1$ $=2$ Av grad $=\frac{2-\frac{7}{5}}{1-(-2)}$ $=\frac{1}{5}$	✓ value of $f(-2)$ ✓ value of $f(1)$ ✓ substitution ✓ answer (4)
5.6	The new point of intersection of the asymptotes will be at $(1\ ;-2)$. $-2=1(1)+c$ $c=-3$ $y=x-3$ **OR** $y-(-2)=1(x-1)$ $y+2=x-1$ $y=x-3$	✓1 ✓–2 ✓ subst m = 1 and $(1\ ;-2)$. ✓ answer **OR** ✓ subst m = 1 and $(1\ ;-2)$. ✓ answer (4)
		[19]

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QUESTION 6

6.1	$x+1=0$ $x=-1$ P(–1 ; 0)	✓ $y=0$ ✓ $x=-1$ (2)
6.2	$y=a(x+1)(x-5)$ $8=a(3+1)(3-5)$ $8=-8a$ $a=-1$ $y=-1(x+1)(x-5)$ $=-x^2+4x+5$	✓ subst x-intercepts ✓ subst (3 ; 8) ✓ $a=-1$ (3)
6.3	RS = 5 – 1 = 4 units	✓ y at S = 1 ✓ answer (2)
6.4	Axis of symmetry: $x=\frac{-4}{2(-1)}=2$ Maximum value: $y=-(2)^2+4(2)+5=9$ T(2 ; 9)	✓ $x=2$ ✓ substitution of x ✓ $y=9$ (3)
6.5	$-x^2+4x+5=x+k$ $-x^2+3x+5-k=0$ $\Delta=(3)^2-4(-1)(5-k)$ $=29-4k$ For a tangent: $29-4k=0$ $k=\frac{29}{4}$	✓ equating ✓ calculating Δ ✓ $\Delta=0$ ✓ answer (4)
6.6	$5<n<\frac{29}{4}$ **OR** $n\in\left(5;\frac{29}{4}\right)$	✓✓ answer ✓✓ answer (2)
6.7	$d=5$	✓✓ $d=5$ (2)
		[18]

TOTAL: 100

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