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KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

MATHEMATICS P1

COMMON TEST

JUNE 2024

MARKING GUIDELINES

NATIONAL SENIOR CERTIFICATE

GRADE 11

MARKS: 100

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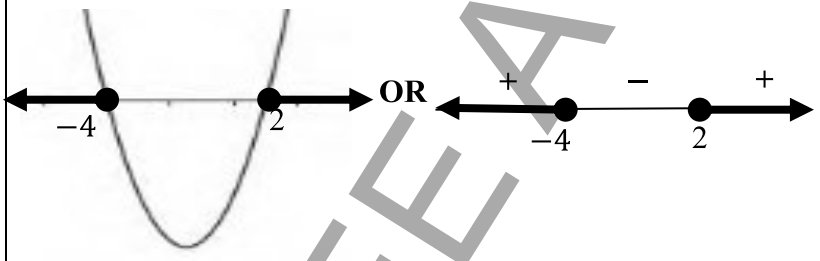
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GRADE 11
Marking Guideline

These marking guidelines consist of 10 pages.

QUESTION 1

1.1.1	$x=0$ or $x=\frac{1}{2}$	✓A $x=0$ ✓A $x=\frac{1}{2}$ (2)
1.1.2	$2x^2-5x+3=0$ $(2x-3)(x-1)=0$ $x=\frac{3}{2}$ or $x=1$	✓A correct factors ✓CA answer ✓CA answer (3)
1.1.3	$x(3x-5)=7$ $3x^2-5x-7=0$ $x=\frac{-(-5)\pm\sqrt{(-5)^2-4(3)(-7)}}{2(3)}$ $x=-0,91$ or $x=2,57$	✓A standard form ✓CA correct substitution ✓CA answer ✓CA answer (4)
1.1.4	$(1-x)(x+3)\le -5$ $x+3-x^2-3x+5\le 0$ $-x^2-2x+8\le 0$ $x^2+2x-8\ge 0$ $(x+4)(x-2)\ge 0$  $x\le -4$ or $x\ge 2$	✓A standard form ✓CA critical values ✓CA answer ✓CA answer (4)

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1.1.5	$\frac{x^2+7}{x^2-2x-3}+\frac{2}{x+1}=-\frac{1}{x-3}$ $\frac{x^2+7}{(x-3)(x+1)}+\frac{2}{x+1}+\frac{1}{x-3}=0$ LCD : $(x-3)(x+1)$ $\frac{x^2+7+2(x-3)+1(x+1)}{(x-3)(x+1)}=0$ $\frac{x^2+7+2x-6+x+1}{(x-3)(x+1)}=0$ $x^2+3x+2=0$ $(x+1)(x+2)=0$ $x\neq -1$ or $x=-2$	✓A correct factorisation ✓CA correct LCD ✓CA standard form ✓CA factors ✓CA answers with rejection (5)
1.2.1	$x-3=2\sqrt{x}$ $(x-3)^2=\left(2\sqrt{x}\right)^2$ $x^2-6x+9=4x$ $x^2-10x+9=0$ $(x-9)(x-1)=0$ $x=9$ or $x\neq 1$ **OR** $x-3=2\sqrt{x}$ $x-2\sqrt{x}-3=0$ $\left(\sqrt{x}\right)^2-2\sqrt{x}-3=0$ $\left(\sqrt{x}-3\right)\left(\sqrt{x}+1\right)=0$ $\sqrt{x}=3$ or $\sqrt{x}\neq -1$ $\therefore x=9$	✓A squaring both sides ✓CA standard form ✓CA factors ✓CA answers with rejection (4) ✓A standard form ✓CA factors ✓CA both equations ✓CA answers with rejection (4)
1.2.2	$\sqrt[3]{3t}=9$ $\left(\sqrt[3]{3t}\right)^3=9^3$ $\frac{3t}{3}=\frac{729}{3}$ $t=243$	✓CA $\sqrt[3]{3t}=x$ from 1.2.1 ✓M cubing both sides ✓CA answer (3)

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1.3	$3y = x+1$.....(1) $(x-y)(5y-3x)=0$.....(2) $x = 3y-1$.....(3) $[((3y-1)-y)(5y-3(3y-1))]=0$ $(2y-1)(3-4y)=0$ $y=\frac{1}{2}$ or $y=\frac{3}{4}$ $x=\frac{1}{2}$ or $x=\frac{5}{4}$	✓A rewriting in terms of x ✓CA subst. of (3) into (2) ✓CA simplification ✓CA both values of y ✓CA both values of x (5)
	OR $3y = x+1$.....(1) $(x-y)(5y-3x)=0$.....(2) from (2) $x = y$ or $y=\frac{3}{5}x$.....(3) sub (3) into (1) $3x = x+1$ or $3\left(\frac{3}{5}x\right)=x+1$ $2x=1$ or $\frac{9}{5}x=x+1$ $x=\frac{1}{2}$ or $x=\frac{5}{4}$ sub $x-$values into (3) $y=\frac{1}{2}$ or $y=\frac{3}{4}$	**OR** ✓A solving for y ito x in (2) ✓CA subst. both into eq. (1) ✓CA simplification ✓CA both values of x ✓CA both values of y (5)

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1.4	$x = \frac{3 \pm 3\sqrt{5}}{2}$ $x = \frac{3 \pm \sqrt{45}}{2}$ $\Delta = 45$ and $x^2 - 3x - k = 0$ $\Delta = b^2 - 4ac$ $\Delta = (-3)^2 - 4(1)(-k)$ $\Delta = 9 + 4k$ $\therefore 9 + 4k = 45$ $\frac{4k}{4} = \frac{45-9}{4}$ $k = 9$ **OR** $(2x - 3 + 3\sqrt{5})(2x - 3 - 3\sqrt{5}) = 0$ $(2x-3)^2 - (3\sqrt{5})^2 = 0$ $4x^2 - 12x + 9 - 9(5) = 0$ $4x^2 - 12x - 36 = 0$ $x^2 - 3x - 9 = 0$ $\therefore k = 9$	✓A rewriting Δ as $\sqrt{45}$ ✓A substitution into Δ ✓CA equating two Δs ✓CA answer (4) **OR** ✓A rewriting roots as factors of equation ✓A standard form ✓CA ÷ equation by 4 ✓CA answer (4)
		[34]

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QUESTION 2

2.1.1	$\frac{2^{4x+1}.9^x.6^{2x-1}}{2^{6x}.27^x.3^x}$ $=\frac{2^{4x+1}.(3^2)^x.(3\times 2)^{2x-1}}{2^{6x}.(3^3)^x.3^x}$ $=\frac{2^{4x+1}.3^{2x}.3^{2x-1}.2^{2x-1}}{2^{6x}.3^{3x}.3^x}$ $=2^{4x+1+2x-1-6x}.3^{2x+2x-1-3x-x}$ $=2^0.3^{-1}$ $=1\times\frac{1}{3}$ $=\frac{1}{3}$	✓A rewriting with prime bases ✓CA separate prime bases ✓CA simplifying: exponential laws ✓CA answer (4)
2.1.2	$\frac{3^{2021}-3^{2017}}{60.\left(\sqrt[3]{3^{6048}}\right)}$ $=\frac{3^{2017}(3^4-1)}{60.3^{2016}}$ $=\frac{3^{2017-2016}(80)}{60}$ $=4$	✓A common factor in numerator 3^{2017} ✓A 3^{2016} in denominator ✓A 80 in numerator ✓CA answer (4)
2.2.1	$m^{8x-4}=1$ $m^{8x-4}=m^0$ $8x-4=0$ $x=\frac{1}{2}$ **OR** $m^{8x-4}=1$ $\frac{m^{8x}}{m^4}=1$ $m^{8x}=m^4$ $8x=4$ $x=\frac{1}{2}$	✓A m^0 ✓CA equating exponents ✓CA answer (3) **OR** ✓A $m^{8x}=m^4$ ✓CA equating exponents ✓CA answer (3)

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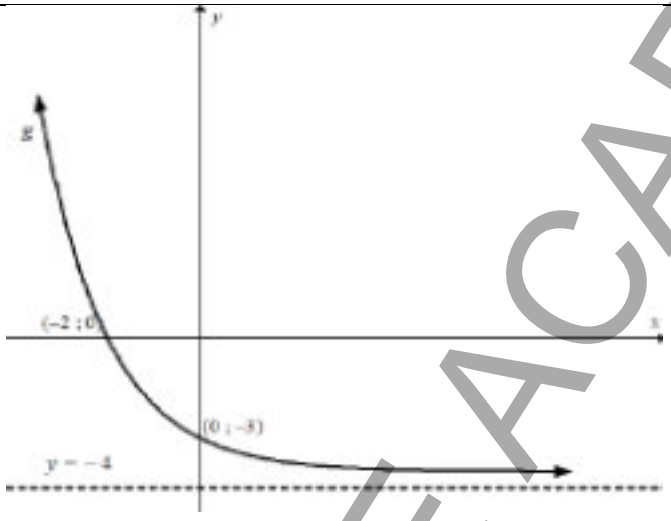
2.2.2	$4.3^x - 3^{x-2} + 3^x = \frac{44}{3}$ $4.3^x - 3^x.3^{-2} + 3^x = \frac{44}{3}$ $3^x(4 - 3^{-2} + 1) = \frac{44}{3}$ $3^x\left(\frac{44}{9}\right) = \frac{44}{3}$ $3^x = \frac{44}{3} \times \frac{9}{44}$ $3^x = 3^1$ $x = 1$	✓A common factor of 3^x ✓A factor of $\frac{44}{9}$ ✓CA simplification ✓CA answer (4)
2.2.3	$x^x = 2^{2048}$ $x^x = 2^{2(1024)}$ $x^x = 4^{2(512)}$ $x^x = 16^{(512)}$ $x^x = 16^{2(256)}$ $x^x = 256^{256}$ $\therefore x = 256$ **OR** $x^x = 2^{2048}$ $x^x = 2^{1024}.2^{1024}$ $x^x = (2.2)^{1024}$ $x^x = 4^{1024}$ $x^x = 4^{512}.4^{512}$ $x^x = 16^{256}.16^{256}$ $x^x = (16.16)^{256}$ $x^x = 256^{256}$ $\therefore x = 256$	✓A rewriting the exp. as 2(1024) ✓A rewriting as $16^{(512)}$ ✓A answer (3) ✓A rewriting the RHS as $2^{1024}.2^{1024}$ ✓A rewriting as $16^{256}.16^{256}$ ✓A answer (3)
		[18]

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QUESTION 3

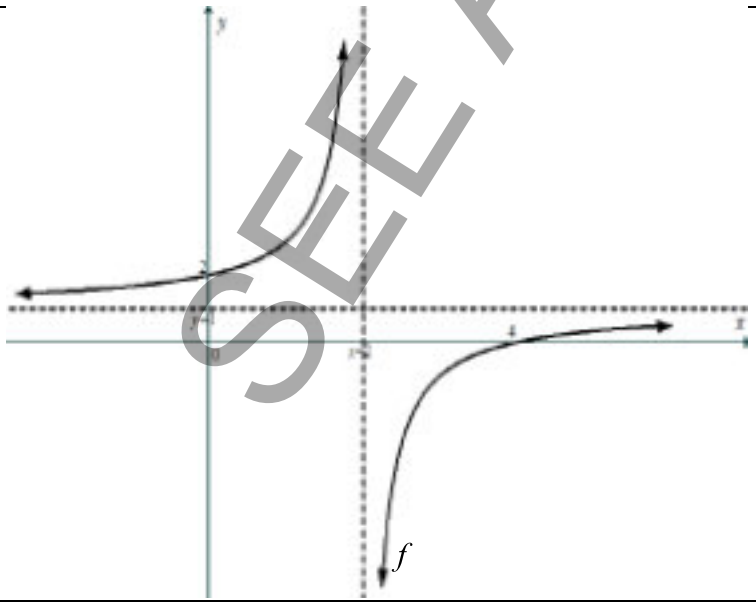
3.1	$y = -4$	✓A answer (1)
3.2	$g(x) = \left(\frac{1}{2}\right)^x - 4$ $g(0) = \left(\frac{1}{2}\right)^0 - 4$ $g(0) = 1 - 4$ $y = -3$	✓A $g(0)$ **OR** substitute $x = 0$ ✓CA value of y (2)
3.3	$g(x) = \left(\frac{1}{2}\right)^x - 4$ $0 = \left(\frac{1}{2}\right)^x - 4$ $4 = 2^{-x}$ $2^2 = 2^{-x}$ $x = -2$	✓A $g(x) = 0$ ✓CA value of x (2)
3.4.		✓A shape ✓CA intercepts ✓A asymptote (3)
3.5	$m = \frac{y_2 - y_1}{x_2 - x_1}$ $m = \frac{(0) - (-3)}{(-2) - (0)}$ $m = -\frac{3}{2}$	✓CA substitution of x- and y- intercepts from 3.2 and 3.3 ✓CA answer (2)
3.6	$k(x) = \left(\frac{1}{2}\right)^x$	✓A answer (1)
3.7	reflection about y-axis and then translation/shift of 3 units to the left **OR** translation/shift of 3 units to the right and then reflection about y-axis	✓A reflection about y–axis ✓A translation of 3 units ✓A left (3) **OR** ✓A translation of 3 units ✓A right ✓A reflection about y–axis (3)
		[14]

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QUESTION 4

4.1	$y \in$, $y \neq 1$ or $y \in (-\infty ; 1) \cup (1 ; \infty)$	✓A answer (1)
4.2	$x = 3 - y$ $x = 3 - 1$ $x = 2$	✓A substitution ✓A answer (2)
4.3	$f(x) = \frac{a}{x+p} + 1$ $f(x) = \frac{a}{x-2} + 1$ $2 = \frac{a}{0-2} + 1$ $2 - 1 = \frac{a}{-2}$ $a = -2$	✓A substitution of a point (0; 2) ✓CA answer (2)
4.4	$f(x) = \frac{-2}{x-2} + 1$ $0 = \frac{-2}{x-2} + 1$ $-1 = \frac{-2}{x-2}$ $-1(x-2) = -2$ $-x + 2 = -2$ $-x = -4$ $x = 4$	✓A $f(x) = 0$ ✓CA simplification ✓CA answer (3)
4.5		✓CA shape based on a in 4.3 ✓CA vertical asymptote from 4.2 but horizontal asymptote of $y = 1$ must be accurate ✓CA x-intercept from 4.4 but y-intercept must be accurate (given in 4.3) (3)
4.6	$2 < x \leq 4$ **OR** $x \in (2;4]$	✓✓CA answer (2)
4.7	Q(3 ; −1)	✓A $x-$value ✓A $y-$value (2)
		[15]

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QUESTION 5

5.1	D(4 ; 0)	✓A answer (1)
5.2	$h(x)=a(x-x_1)(x-x_2)$ $h(x)=a(x-(-3))(x-(1))$ $6=a(0+3)(0-1)$ $6=a(-3)$ $\frac{6}{-3}=a$ $-2=a$ $h(x)=-2(x+3)(x-1)$ $h(x)=-2(x^2+2x-3)$ $h(x)=-2x^2-4x+6$ $a=-2\ ,\ b=-4\ ,\ c=6$	✓A defining equation ✓A substituting x-intercepts ✓A substituting $(0\ ;\ 6)$ ✓A simplification (4)
5.3	$h(x)=-2x^2-4x+6$ $x=-\frac{b}{2a}$ $x=\frac{-4}{2(-2)}$ $x=-1$ $h(-1)=-2(-1)^2-4(-1)+6$ $y=8$ M$(-1\ ;\ 8)$ **OR** $x_M=\frac{-3+1}{2}$ $x_M=-1$ $h(-1)=-2(-1)^2-4(-1)+6$ $y=8$ M$(-1\ ;\ 8)$	 ✓A $x-$value ✓CA $y-$value (2) **OR** ✓A $x-$value ✓CA $y-$value (2)
5.4	$y\in$, $y\leq 8$ **OR** $y\in(-\infty\ ;\ 8]$	✓CA answer (using x_M in 5.3) **OR** ✓CA answer (using x_M in 5.3) (1)
5.5	$x<-3$ or $1<x<4$ **OR** $x\in(-\infty\ ;-3)\cup(1\ ;\ 4)$ **NOTE:** CA is only on 4 i.e. x_D in 5.1	✓A $x<-3$ ✓A✓CA $1<x<4$ **OR** ✓ $x\in(-\infty\ ;-3)$ ✓A✓CA $x\in(1\ ;\ 4)$ (3)

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5.6.1	$k > 8$ **OR** $k \in (8\,;\infty)$	✓CA answer (using x_M in 5.3) ✓CA answer (using x_M in 5.3) (1)
5.6.2	$6 < k \leq 8$ **OR** $k \in (6;\,8]$ **NOTE:** CA is only on 8 i.e. x_M in 5.3	✓A✓CA answer ✓A✓CA answer (2)
5.7	If graph p is to now become a tangent, then this implies that the NEW y −intercept is unknown $h(x) = p(x)$ $-2x^2 - 4x + 6 = -2x + k$ $-2x^2 - 2x + 6 - k = 0$ $2x^2 + 2x - 6 + k = 0$ $\Delta = 0$ $b^2 - 4ac = 0$ $(2)^2 - 4(2)(-6 + k) = 0$ $4 - 8(-6 + k) = 0$ $4 + 48 - 8k = 0$ $52 = 8k$ $k = \frac{52}{8} = \frac{13}{2} = 6\frac{1}{2} = 6{,}5$ Graph p must shift/be translated **1,5 units downwards** **NOTE:** Correct answer only: award only 1 mark **OR** $h(x) = p(x) + k$ $-2x^2 - 4x + 6 = -2x + 8 + k$ $-2x^2 - 2x - 2 - k = 0$ $2x^2 + 2x + 2 + k = 0$ $\Delta = 0$ $b^2 - 4ac = 0$ $(2)^2 - 4(2)(2 + k) = 0$ $4 - 8(k + 2) = 0$ $4 = 8(k + 2)$ $\frac{1}{2} = k + 2$ $k = -\frac{3}{2} = -1\frac{1}{2} = -1{,}5$ Graph p must shift/be translated **1,5 units downwards** **NOTE:** Correct answer only: award only 1 mark	✓A equating equations ✓CA standard form ✓CA equating $\Delta = 0$ ✓CA value of k ✓CA answer (5) ✓A equating equations ✓CA standard form ✓CA equating $\Delta = 0$ ✓CA value of k ✓CA answer (5)
		[19]
		TOTAL:100

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