LIMPOPO

PROVINCIAL GOVERNMENT

REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF EDUCATION

LIMPOPO PROVINCE

GRADE 11

MATHEMATICS

JUNE P1 2023

Stanmorephysics

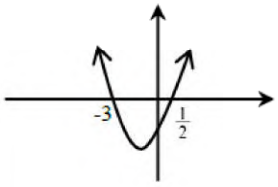
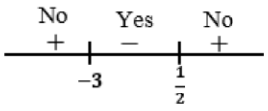
MARKING GUIDELINES

MARKS : 100

DURATION : 2 hours

These marking guidelines consist of 10 pages including the cover page

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QUESTION 1			
1.1.1	$2x(x-3)=0$ $\therefore x=0$ or $x=3$	✓ $x=0$ ✓ $x=3$	(2)
1.1.2	$3x^2-2x=4$ $3x^2-2x-4=0$ $x=\frac{-(-2)\pm\sqrt{(-2)^2-4(3)(-4)}}{2(3)}$ $x=-0{,}87$ or $x=1{,}54$	✓ standard form ✓ substitution into correct formula ✓✓answers	(4)
1.1.3	$\sqrt{5-x}=x+1$ $\left(\sqrt{5-x}\right)^2=(x+1)^2$ $5-x=x^2+2x+1$ $x^2+3x-4=0$ $(x+4)(x-1)=0$ $x\neq -4$ or $x=1$ $\therefore x=1$	✓ squaring both sides ✓ standard form ✓ factors ✓ both solutions to x ✓ rejecting $x=4$	(5)
1.1.4	$2x^2+5x\leq 3$ $2x^2+5x-3\leq 0$ $(x+3)(2x-1)\leq 0$ CV: $x=-3$ or $x=\frac{1}{2}$  ALTERNATIVE METHOD:  $\therefore -3\leq x\leq \frac{1}{2}$	✓ standard form ✓ critical values ✓✓ answer	(4)

1.1.5	$5x^{\frac{2}{5}} = 20$ $x^{\frac{2}{5}} = 4$ $\left(x^{\frac{2}{5}}\right)^{\frac{5}{2}} = (2^2)^{\frac{5}{2}}$ $x = 2^5$ $x = 32$ ALTERNATIVE METHOD: $x^{\frac{2}{5}} = 4$ $\left(x^{\frac{2}{5}}\right)^{5} = (2^2)^{5}$ $x^2 = 2^{10}$ $x = \sqrt{2^{10}}$ $x = 2^5$ $x = 32$	✓ divide both sides by 5 ✓ apply exponent law ✓ $x = 32$ ALTERNATIVE: ✓ raise both sides to power 5 ✓ apply exponent law ✓ $x = 32$	(3)
1.1.6	$2^x - \frac{12}{2^x} = -4$ $(2^x)^2 - 12 = -4.2^x$ $(2^x)^2 + 4.2^x - 12 = 0$ $(2^x + 6)(2^x - 2) = 0$ $2^x \neq -6$ or $2^x = 2$ $\therefore x = 1$ ALTERNATIVE METHOD: Let $k = 2^x$ $k - \frac{12}{k} = -4$ $k^2 - 12 = -4k$ $k^2 + 4k - 12 = 0$ $(k + 6)(k - 2) = 0$ $\therefore 2^x \neq -6$ or $2^x = 2$ $\therefore x = 1$	✓ LCD ✓ $(2^x)^2 - 4.2^x - 12 = 0$ ✓ factors ✓ $2^x \neq -6$ ✓ $x = 1$ ALTERNATIVE: ✓ k-method ✓ $k^2 - 4k - 12 = 0$ ✓ factors ✓ $2^x \neq -6$ ✓ $x = 1$	(5)

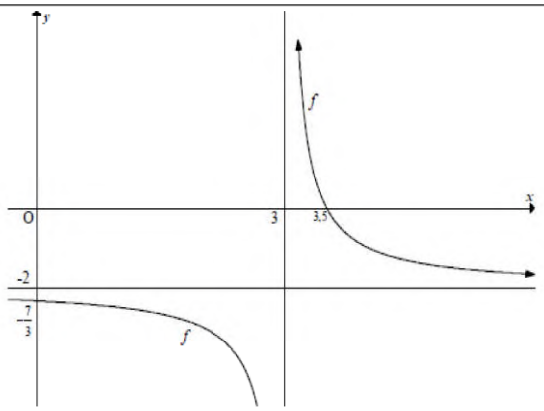
1.2	$5y - x = 2$ (1) $x^2 - 3xy + 4y = 4$ (2) $x = 5y - 2$ (3) Sub (3) into (2): $x^2 - 3xy + 4y = 4$ $(5y - 2)^2 - 3y(5y - 2) + 4y - 4 = 0$ $25y^2 - 20y + 4 - 15y^2 + 6y + 4y - 4 = 0$ $10y^2 - 10y = 0$ $10y(y - 1) = 0$ $y = 0$ or $y = 1$ $x = 5(0) - 2 = -2$ or $x = 5(1) - 2 = 3$	✓ generate 3rd equation ✓ substitution ✓ standard form ✓ factors ✓ both solutions to y ✓ both solutions to x	(6)
			[29]

QUESTION 2

2.1.1	$\left(\frac{8}{27}\right)^{\frac{2}{3}} = \left[\left(\frac{8}{27}\right)^{\frac{1}{3}}\right]^2$ $= \left(\sqrt[3]{\frac{8}{27}}\right)^2$ $= \left(\frac{2}{3}\right)^2$ $= \frac{4}{9}$ ALTERNATIVE METHOD: $\left(\frac{8}{27}\right)^{\frac{2}{3}} = \left(\frac{2^3}{3^3}\right)^{\frac{2}{3}}$ $= \left(\frac{2}{3}\right)^2$ $= \frac{4}{9}$	✓ apply exponent law ✓ method ✓ answer ALTERNATIVE: ✓ prime factor base ✓ method ✓ answer	(3)
2.1.2	$(\sqrt{12} + 2)(\sqrt{3} - 1) = (2\sqrt{3} + 2)(\sqrt{3} - 1)$ $= 2.3 - 2\sqrt{3} + 2\sqrt{3} - 2$ $= 6 - 2$ $= 4$	✓ $2\sqrt{3}$ ✓ $2.3 - 2\sqrt{3} + 2\sqrt{3} - 2$ ✓ answer	

	ALTERNATIVE METHOD: $(\sqrt{12}+2)(\sqrt{3}-1) = \sqrt{36} - 2\sqrt{3} + 2\sqrt{3} - 2$ $= 6 - 2\sqrt{3} + 2\sqrt{3} - 2$ $= 4$	ALTERNATIVE: ✓ $\sqrt{36}$ ✓ $6 - 2\sqrt{3} + 2\sqrt{3} - 2$ ✓ answer	(3)
2.1.3	$\frac{3^{2x+1}.15^{2x-3}}{27^{x-1}.3^{x}.5^{2x-4}}$ $= \frac{3^{2x+1}.(5\times3)^{2x-3}}{(3^3)^{x-1}.3^{x}.5^{2x-4}}$ $= \frac{3^{2x+1}.5^{2x-3}.3^{2x-3}}{3^{3x-3}.3^{x}.5^{2x-4}}$ $= 3^{2x+1+2x-3-3x+3-x}.5^{2x-3-2x+4}$ $= 3.5$ $= 15$	✓ prime bases ✓ apply exponent law ✓ adding and subtracting exponents ✓ answer	(4)
2.2	$\frac{\sqrt{2}}{\sqrt{2}+1} + \frac{4}{\sqrt{2}}$ $= \left(\frac{\sqrt{2}}{\sqrt{2}+1}\times\frac{\sqrt{2}}{\sqrt{2}}\right) + \left(\frac{4}{\sqrt{2}}\times\frac{\sqrt{2}+1}{\sqrt{2}+1}\right)$ $= \frac{\sqrt{2}.\sqrt{2}}{2+\sqrt{2}} + \frac{4\sqrt{2}+4}{2+\sqrt{2}}$ $= \frac{(\sqrt{2})^2 + 4\sqrt{2} + 2^2}{2+\sqrt{2}}$ $= \frac{(\sqrt{2}+2)^2}{2+\sqrt{2}}$ $= 2+\sqrt{2}$ ALTERNATIVE METHOD: $\frac{\sqrt{2}}{\sqrt{2}+1} + \frac{4}{\sqrt{2}}$ $= \left(\frac{\sqrt{2}}{\sqrt{2}+1}\times\frac{\sqrt{2}}{\sqrt{2}}\right) + \left(\frac{4}{\sqrt{2}}\times\frac{\sqrt{2}+1}{\sqrt{2}+1}\right)$ $= \frac{2}{2+\sqrt{2}} + \frac{4\sqrt{2}+4}{2+\sqrt{2}}$ $= \frac{6+4\sqrt{2}}{2+\sqrt{2}}\times\frac{2-\sqrt{2}}{2-\sqrt{2}}$ $= \frac{12+2\sqrt{2}-8}{4-2}$ $= \frac{4+2\sqrt{2}}{2}$ $= \frac{2(2+\sqrt{2})}{2}$ $= 2+\sqrt{2}$	✓ Multiply by LCD: $\sqrt{2}(\sqrt{2}+1)$ ✓ simplify ✓ factors ✓ answer ALTERNATIVE: ✓ Multiply by LCD: $\sqrt{2}(\sqrt{2}+1)$ ✓ simplify ✓ multiply with the conjugate $\frac{2-\sqrt{2}}{2-\sqrt{2}}$ ✓ factorise (IICF:2) ✓ answer	(4)

2.3	$x^2 - mx + (m+3) = 0$ $\Delta = b^2 - 4ac$ For equal roots: $\Delta = 0$ $\therefore (-m)^2 - 4(m+3)(1) = 0$ $m^2 - 4m - 12 = 0$ $(m+2)(m-6) = 0$ $\therefore m = -2$ or $m = 6$	✓ $\Delta = 0$ ✓ substitution ✓ simplify ✓ factorise ✓ both answers	(5)
			[19]

QUESTION 3			
3.1	$x = 3$ and $y = -2$	✓ $x = 3$ and $y = -2$	(1)
3.2	x-intercept: $y = 0$ $0 = \frac{1}{x-3} - 2$ $2(x-3) = 1$ $2x - 6 = 1$ $2x = 7$ $x = \frac{7}{2}$	✓ $y = 0$ ✓ simplify ✓ $x = \frac{7}{2}$	(3)
3.2		✓ asymptotes ✓ shape ✓ x-and y- intercepts	(3)
3.3	$y = x + c$ $-2 = 3 + c$ $c = -5$ $\therefore y = x - 5$	✓ substitution of $(3\,;\,-2)$ ✓ $y = x - 5$	(2)
3.4	Translate f 3 units to the left and 2 units up.	✓ 3 units to the left ✓ 2 units up	(2)

3.5	$x \in (-\infty\,;\,+\infty)\,;x \neq 0$ ALTERNATIVE ANSWER: $x \in \mathbb{R}\,;x \neq 0$	✓ answer	(1)
			[12]

QUESTION 4

4.1	At TP: $x = -\frac{b}{2a} = -\frac{6}{2(-1)} = 3$ $\therefore y = -(3)^2 + 6(3) + 7 = 16$ $\therefore (3\,;16)$ ALTERNATIVE METHOD: $f(x) = -x^2 + 6x + 7$ $= -(x^2 - 6x - 7)$ $= -[(x^2 - 6x + 9) - 9 - 7]$ $= -[(x-3)^2 - 16]$ $= -(x-3)^2 + 16$ $\therefore (3\,;16)$ ALTERNATIVE METHOD: x- intercepts at 7 and -1: $\therefore x_{TP} = \frac{7+(-1)}{2} = 3$ $\therefore y = -(3)^2 + 6(3) + 7 = 16$ $\therefore (3\,;16)$	✓ method ✓ x-coordinate ✓ y-coordinate ALTERNATIVE: ✓ method ✓ x-coordinate ✓ y-coordinate ALTERNATIVE: ✓ method ✓ x-coordinate ✓ y-coordinate	(3)
4.2	$x = 3$	✓ answer	(1)
4.3	$f(x) = -x^2 + 6x + 7$ $= -(x-3)^2 + 16$ $\therefore h(x) = (x - 3 + 4)^2 + 16$ $= (x+1)^2 + 16$	✓ $a = 1$ and $q = 16$ ✓ $p = 1$	(2)
			[6]

QUESTION 5			
5.1.1	$y = -4$	✓ answer	(1)
5.1.2	$y > -4$	✓ answer	(1)
5.1.3	$g(x) = \left(\frac{1}{2}\right)^x - 4$ x-intercept: $y = 0$ $0 = \left(\frac{1}{2}\right)^x - 4$ $4 = \left(\frac{1}{2}\right)^x$ $\therefore 2^2 = 2^{-x}$ $\therefore x = -2$ $\therefore (-2\,;0)$	✓ substitute $y = 0$ ✓ mathematical procedure ✓ coordinate of x-intercept	(3)
5.1.4	$x > -2$	✓ answer	(1)
5.2.1	$y = 3^{x+p} - 27$ $54 = 3^{3+p} - 27$ $81 = 3^{3+p}$ $3^4 = 3^{3+p}$ $\therefore 4 = 3 + p$ $\therefore p = 1$	✓ substitution (3; 54) ✓ equating indices ✓ answer	(3)
5.2.2	$y > -27$ or $y \in (-27\,;\infty)$	✓ answer	(1)
5.2.3	$g(x) = -f(x)$ $g(x) = -(3^{x+1} - 27)$ $= -3^{x+1} + 27$ $y = -3^{0+1} + 27 = 24$ $\therefore y$-intercept at $(0\,;24)$	✓ $g(x) = -f(x)$ ✓ new equation ✓ answer	(3)
			[13]

QUESTION 6			
6.1	$y = -3x + k$ $0 = -3(5) + k$ $\therefore k = 15$	✓ substitute with $(5\,;\ 0)$	(1)

6.2	$x = -\frac{b}{2a} = \frac{-2}{2(-1)} = 1$ $\therefore y = -(1)^2 + 2(1) + 15 = 16$ $\therefore D(1\,;16)$ ALTERNATIVE METHOD: $x = \frac{-3+5}{2} = 1$ $\therefore y = -(1)^2 + 2(1) + 15 = 16$ $\therefore D(1\,;16)$	✓ $x = 1$ ✓ substitution ✓ $y = 16$ ALTERNATIVE: ✓ $x = 1$ ✓ substitution ✓ $y = 16$	(3)
6.3	$x < 1$ ALTERNATIVE ANSWER: $x \in (-\infty\,;1)$	✓ answer	(1)
6.4	$A(-3\,;0)$ and $D(1\,;16)$ $m = \frac{y_A - y_D}{x_A - x_D} = \frac{0-16}{-3-1} = 4$	✓ subst. into gradient formula ✓ answer	(2)
6.5	$D(1\,;16)$ and $E(1\,;12)$ $\therefore DE = 4$ units	✓ $E(1\,;\,12)$ ✓ answer	(2)
6.6	$h(x) = f(x-1) - 2$ $= -(x-1)^2 + 2(x-1) + 15 - 2$ $= -x^2 + 2x - 1 + 2x - 2 + 13$ $= -x^2 + 4x + 10$ $= -(x^2 - 4x - 10)$ $= -(x^2 - 4x + 4 - 4 - 10)$ $= -(x-2)^2 + 14$ ALTERNATIVE METHOD: $D(1\,;16)$ and $a = -1$ $\therefore f(x) = -(x-1)^2 + 16$ $h(x) = f(x-1) - 2$ $= -(x-1-1)^2 + 16 - 2$ $= -(x-2)^2 + 14$	✓ $-(x-1)^2 + 2(x-1) + 15 - 2$ ✓ $-x^2 + 4x + 10$ ✓ $h(x) = -(x-2)^2 + 14$ ALTERNATIVE: ✓ substitute D (1 ; 16) and $a = -1$ ✓$h(x) = -(x-1-1)^2 + 16 - 2$ ✓ $h(x) = -(x-2)^2 + 14$	(3)
6.7.1	$-3 \leq x \leq 5$	✓ answer	(1)

6.7.2	$x < 0$ and $x > 5$	✓ $x < 0$ ✓ $x > 5$	(2)
6.8	Max value of $f(x)$ is 16 $\therefore f(x) - 12 = 16 - 12 = 4$ $\therefore$ max value of $p(x) = 3^4$ $= 81$	✓ Max value of $f(x)$ is 16 ✓ $f(x) - 12 = 4$ ✓ answer	(3)
6.9	$-x^2 + 2x + 15 + k = 0$ $b^2 - 4ac > 0$ $(2)^2 - 4(-1)(15 + k) > 0$ $4k > -64$ $k > -16$	✓ $\Delta > 0$ ✓ correct substitution ✓ answer	(3)
			[21]

TOTAL: 100

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