GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GAUTENG DEPARTMENT OF EDUCATION

PROVINCIAL EXAMINATION

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GRADE 11

MATHEMATICS P1

MEMORANDUM

11 pages

GAUTENG DEPARTMENT OF EDUCATION−

PROVINCIAL EXAMINATION

MATHEMATICS
(Paper 1)

MEMORANDUM

QUESTION 1

1.1		$(x-2)(3x+4)=0$ $x=2$ **OR** $x=-\frac{4}{3}$	✓ $x=2$ ✓ $x=-\frac{4}{3}$	(2)
1.2	1.2.1	$\sqrt{2-x} = x+4$ $(\sqrt{2-x})^2=(x+4)^2$ $2-x = x^2+8x+16$ $x^2+8x+16+x-2=0$ $x^2+9x+14=0$ $(x+2)(x+7)=0$ $x=-2$ **OR** $x=-7$ NA	✓ Squaring both sides ✓ Standard form ✓ Factors ✓ Answers ✓ $x=-2$ only	(5)
	1.2.2	$2x(x-3)=1$ $2x^2-6x-1=0$ $a=2; b=-6; c=-1$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\frac{-(-6)\pm\sqrt{(-6)^2-4(2)(-1)}}{2(2)}$ $x=\frac{6\pm\sqrt{36+8}}{4}$ $x=\frac{6\pm\sqrt{44}}{4}$ $x = 3{,}2$ **OR** $x = -0{,}2$	✓ Standard form ✓ Substitution ✓ Answer ✓ answer	(4)

	1.2.3	$\frac{x^2+4x+3}{x-1} > 0$ $\frac{x^2+4x+3}{x-1} > 0 \qquad x \neq 1$ $\frac{(x+1)(x+3)}{x-1} > 0$ $-3 < x < -1$ or $x > 1$ **OR** $(-3 ; -1) \cup (1 ; \infty)$	✓ $x+1$ ✓ $x+3$ ✓ Critical values in context of an inequality ✓ correct notation Only focus on numerator	(4)
1.3	$2x^2 - 3x = 8$ $x^2 - \frac{3}{2}x = 4$ $x^2 - \frac{3}{2}x + \left(\frac{1}{2} \times \frac{-3}{2}\right)^2 = 4 + \left(\frac{1}{2} \times \frac{-3}{2}\right)^2$ $\left(x - \frac{3}{4}\right)^2 = 4 + \frac{9}{16}$ $\left(x - \frac{3}{4}\right)^2 = \frac{73}{16}$ $x - \frac{3}{4} = \pm\sqrt{\frac{73}{16}}$ $x = \frac{3}{4} \pm \sqrt{\frac{73}{16}}$ $x = \frac{3+\sqrt{73}}{4}$ **OR** $x = \frac{3-\sqrt{73}}{4}$ $x = 2,89$ **OR** $x = -1,39$		✓ Divide by 2 ✓ $\frac{73}{16}$ ✓ Finding square root ($\pm$) ✓ $x = 2,89$ ✓ $x = -1,39$ Use of quadratic formula max 2/5 for the two correct answers.	(5)
				[20]

QUESTION 2

2.1	$\frac{3.3^x - 4.3^{x+2}}{3^x - 3^{x+1}}$ $=\frac{3.3^x - 4.3^x.3^2}{3^x - 3^x.3^1}$ $=\frac{3^x(3-4.9)}{3^x(1-3)}$ $=\frac{3-36}{-2}$ $=\frac{-33}{-2}$ $= 16\frac{1}{2}$ **OR** $\frac{33}{2}$		✓ Expansion ✓ $3^3(3-4.9)$ ✓ $3^x(1-3)$ ✓ Answer If *k*-method is used exactly the same mark allocation	(4)
2.2	2.2.1	$\frac{\sqrt{5}}{\sqrt{5}+2} + \frac{10}{\sqrt{5}}$ $= \frac{5+10(\sqrt{5}+2)}{5+2\sqrt{5}}$ $= \frac{5+10\sqrt{5}+20}{5+2\sqrt{5}}$ $= \frac{25+10\sqrt{5}}{5+2\sqrt{5}}$ $= \frac{5(5+2\sqrt{5})}{5+2\sqrt{55}}$ $= 5$ **OR** $\frac{\sqrt{5}}{\sqrt{5}+2} + \frac{10}{\sqrt{5}}$ $\frac{\sqrt{5}}{\sqrt{5}+2} \times \frac{\sqrt{5}-2}{\sqrt{5}-2} + \frac{10}{\sqrt{5}}$ $= \frac{5-2\sqrt{5}}{5-4} + \frac{10}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ $=5 - 2\sqrt{5} + \frac{10\sqrt{5}}{5}$ $=5 - 2\sqrt{5} + 2\sqrt{5}$ $=5$	✓ $\frac{5+10(\sqrt{5}+2)}{5+2\sqrt{5}}$ ✓ simplification ✓ $\frac{5(5+2\sqrt{5})}{5+2\sqrt{55}}$ ✓ answer Rationalizing the denominator ✓ Rationalizing the denominator ✓ Simplification ✓ Answer	(4)

	2.2.2	$(\frac{\sqrt{7^{2011}}-\sqrt{7^{2009}}}{\sqrt{7^{2008}}}+\sqrt{7})^2$ $=(\frac{\sqrt{7^{2008}}(\sqrt{7^3}-\sqrt{7^1})}{\sqrt{7^{2008}}}+\sqrt{7})^2$ $=(\sqrt{7^3}-\sqrt{7^1}+\sqrt{7})^2$ $=(7\sqrt{7}-\sqrt{7}+\sqrt{7})^2$ $=(7\sqrt{7})^2$ $=343$ **OR**	✓ $\sqrt{7^{2008}}$ ✓ $\sqrt{7^3}-\sqrt{7^1}$ ✓ $(7\sqrt{7})^2$ ✓ Answer	
	2.2.2 cont.	$(\frac{\sqrt{7^{2011}}-\sqrt{7^{2009}}}{\sqrt{7^{2008}}}+\sqrt{7})^2$ $=(\frac{7^{\frac{2011}{2}}-7^{\frac{2009}{2}}}{7^{\frac{2008}{2}}}+\sqrt{7})^2$ $=(\frac{7^{\frac{2009}{2}}(7-1)}{7^{1004}}+\sqrt{7})^2$ $=(7\sqrt{7})^2$ $=(49)(7)$ $=343$	✓ $7^{\frac{2009}{2}}$ ✓ $(7-1)$ ✓ $(7\sqrt{7})^2$ ✓ Answer	(4)
2.3	from: $2^x \cdot 4^y = 1$ $2^x \cdot 2^{2y} = 2^0$ $x + 2y = 0$ $x = -2y$.....① subst ① into $(4^y)^x = \frac{1}{16}$ $(4^y)^{-2x} = \frac{1}{16}$ $2^{-4y^2} = 2^{-4}$ $-4y^2 = -4$ $y = \pm 1$ subst $y = \pm 1$ into ① $y = 1$ $x = -2$ $y = -1$ $x = 2$ **OR**	✓ 2^{2y} ✓ $x + 2y = 0$ **OR** $x = -2y$ ✓ substitution ✓ same bases on either side ✓ $y = \pm 1$ ✓ $x = \pm 2$	(6)

	$2^x.4^y = 1$ $2^x.2^{2y} = 2^0$ $x + 2y = 0$.....1 $(4^y)^x = \frac{1}{16}$ $2^{2xy} = 2^{-4}$ $2xy = -4$ $y = -\frac{2}{x}$.....2 $x + 2\left(-\frac{2}{x}\right) = 0$ $x^2 - 4 = 0$ $(x-2)(x+2) = 0$ $x = -2$ or $x = 2$ $y = -\frac{2}{x}$ $= -\frac{2}{2}$ or $-\frac{2}{-2}$ $y = -1$ $y = 1$	✓ 2^{2y} ✓ $x + 2y = 0$ **OR** $x = -2y$ ✓ $2^{2xy} = 2^{-4}$ ✓ $2xy = -4$ ✓ $y = \pm 1$ ✓ $x = \pm 2$	
			[18]

QUESTION 3

3.1	3.1.1	Roots are non-real (imaginary) therefore $\Delta < 0$.	✓✓Non-real roots **OR** ✓✓ $\Delta < 0$	(2)
	3.1.2	Roots are real and equal, $\Delta = 0$	✓ Roots are real ✓ Roots equal	(2)
3.2		$\Delta = (2k-1)^2 - 4(k)(k-1)$ $= 4k^2 - 4k + 1 - 4k^2 + 4k$ $= 1$ 1 is a perfect square, the coefficients are rational, so the roots are rational.	✓ Substitution ✓ Simplification ✓ Value of **1** ✓ Perfect square	(4)
				[8]

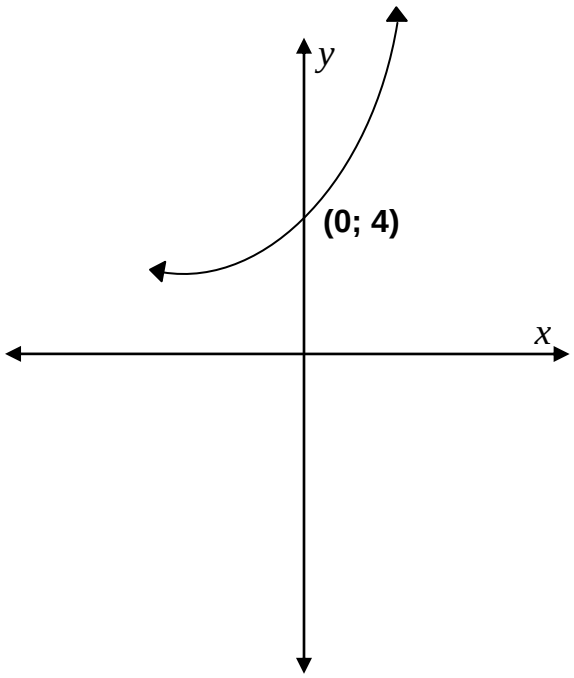
QUESTION 4

4.1	4.1.1	-1; 8; 23;	✓ –1 ✓8 ✓23	(3)
	4.1.2	$3k^2 - 4 = 71$ $k^2 = 25$ $k = \pm 5$ $\therefore k = 5$	✓$3k^2 - 4 = 71$ ✓ $k^2 = 25$ or $(k-5)(k+5)$ ✓ $k = 5$ No marks for $k = \pm 5$	(3)
4.2	4.2.1	Quadratic number pattern 0 ; 5 ; 12 ; 21; .... 5 7 9 2 2 Quadratic number pattern **OR/OF** Quadratic number pattern The first difference is not constant but the second difference is constant.	✓ Quadratic ✓ second difference is constant or illustration If the learner only show the pattern without justification only 1 mark	(2)

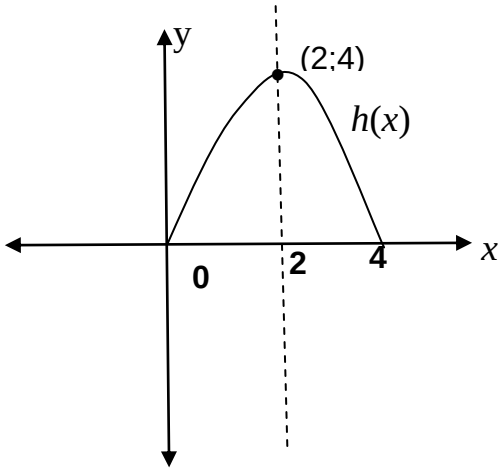
	4.2.2	$2a = 2$ $\therefore a = 1$ $3a + b = 5$ $3(1) + b = 5$ $\therefore b = 2$ $T_1 = a + b + c$ $0 = 1 + 2 + c$ $\therefore c = -3$ $\therefore Tn = an^2 + bn + c$ $Tn = n^2 + 2n - 3$	✓$a = 1$ ✓$b = 2$ ✓$c = -3$ ✓$Tn = n^2 + 2n - 3$	(4)
4.3	4.3.1	Row 4 $7^2 - 6^2 + 5^2 - 4^2 = 22$ Row 20 $23^2 - 22^2 + 21^2 - 20^2 = 86$	✓ Row 4 = 22 ✓Row 20 = 86	(2)
	4.3.2	$(n+3)^2 - (n+2)^2 + (n+1)^2 - n^2 = 4n + 6$	✓ $a = n + 3$ ✓$b = n + 2;\ c = n + 1;\ d = n$ ✓ $T_n = 4n + 6$ If only the general term was given 1/3	(3)
				[17]

QUESTION 5

5.1	$x = -2$ and $y = 1$	✓ $x = -2$ ✓ $y = 1$ Both has to be in equation form. If not 0/2 If $p = -2$ and $q = 10/2$	(2)
5.2	Sub B = (0; -2) in $y = \frac{k}{x+2} + 1$ $-2 = \frac{k}{0+2} + 1$ $-2 = \frac{k}{2} + 1$ $-3 = \frac{k}{2}$ then $k = -6$ $\therefore y = \frac{-6}{x+2} + 1$	✓ Substitution of (0 ; –2) and $q = 1$ ✓ k value ✓ Answer	(3)

5.3	$0 = \frac{-6}{x+2} + 1$ $-1 = \frac{-6}{x+2}$ $(x+2) = 6$ $x = 4$ $\therefore D(4\ ;\ 0)$	✓ $y = 0$ ✓ $x+2=6$ ✓ $x = 4$ ✓ Writing Point D in coordinate form.	(4)
5.4	C(–2 ; 0) and B(4 ; 0) $y = a(x+2)(x-4)$ $-2 = a(0+2)(0-4)$ $-2 = a(-8)$ $\frac{1}{4} = a$ $y = \frac{1}{4}(x+2)(x-4)$ $y = \frac{1}{4}(x^2 - 2x - 8)$ $= \frac{1}{4}x^2 - \frac{1}{2}x - 2$	CA from 5.3 ✓ $x+2$ ✓ $(x-4)$ ✓ Sub. B (0; –2) ✓ $a = \frac{1}{4}$ ✓ answer in any form	(5)
5.5	$g(x) = 2^{x+2}$  	✓ Shape ✓ Coordinates of (0 ; 4) ✓ Graph not crossing the x- axis	(3)
5.6	$y = 2^{x-1}$	✓✓ $y = 2^{x-1}$	(2)
5.7	y is real , $y \neq 1$ ($y \in \mathbb{R}$)	✓ y is real, $y \neq 1$ both condition	(1)
			[20]

QUESTION 6

6.1	$x \in [0\ ;\ 4]$ **OR** $0 \le x \le 4$	✓ 0 ✓ 4	(2)
6.2	$h(x) = -(x^2 - 4x + 4 - 4)$ $= -(x-2)^2 - 4$	✓ $a = -1$. ✓ $p = -2$. ✓ $q = -4$.	(3)
6.3		CA from 6.1 ✓ Shape (neg graph) ✓ Turning point ✓ *y*-intercept. ✓ positive *y*-values only.	(4)
6.4	$h(x) = -x^2 + 4x$ $= -(x-5)^2 + 4(x-5)$ $= -(x^2 - 10x + 25) + 4x - 20$ $= -x^2 + 10x - 25 + 4x - 20$ $\therefore h(x-5) = -x^2 + 14x - 45$ **OR** $y = -(x-2)^2 + 4$ $= -(x-2-5)^2 + 4$ $= -(x-7)^2 + 4$ $= -(x^2 - 14x + 49) + 4$ $= -x^2 + 14x - 49 + 4$ $= -x^2 + 14x - 45$	✓ Sub x with $(x-5)$ ✓ Simplification ✓ Answer **OR** ✓ $(x-2-5)^2$ ✓ Simplification ✓ Answer	(3)

6.5	$k(x) = x^2 - 4x$	✓ x^2 ✓ $-4x$	(2)
6.6	$p(-3) = \frac{9}{2}$ $p(-1) = \frac{1}{2}$ Average gradient $= \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{\frac{9}{2} - \frac{1}{2}}{-3-(-1)}$ $\therefore$ Average gradient of $p = -2$	✓ $p(-3) = \frac{9}{2}$ ✓ $p(-1) = \frac{1}{2}$ ✓ Answer	(3)
			[17]