GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

2015

MEMORANDUM

SUBJECT:	**MATHEMATICS P1 (10611)**

GAUTENG DEPARTMENT OF EDUCATION

PREPARATORY EXAMINATION – 2015

MATHEMATICS
(First Paper)

MEMORANDUM

QUESTION 1		**[21 MARKS]**	
1.1	1.1.1	$x = -\frac{5}{2}$ or $x = \sqrt{2}$ or $x = -\sqrt{2}$	3A
			[3]
	1.1.2	$x^2 \geq 9$ or $x^2 - 9 \geq 0$	1A
		$x \geq 3$ or $x \leq -3$	1A for critical value of 3 2A for each inequality Max 2/3 if 'and' is used Full marks if 'or' is omitted
			[4]
	1.1.3	$6^{2x}.2^{2x} = 8.6^{2x}$ or $2^{4x}.3^{2x} = 8.3^{2x}.2^{2x}$ or $2^{4x}.3^{2x} = 2^{3+2x}.3^{2x}$	1A for factorizing bases
		$2^{2x} = 8$	1CA
		$2x = 3$	1CA
		$x = \frac{3}{2}$	1CA
			[4]
1.2		$(x+1)^2 = \frac{9}{2}$	1A
		$x + 1 = \pm\sqrt{\frac{9}{2}}$	1CA
		$x = 1{,}12$ or $x = -3{,}12$	2CA for each solution
		OR	
		$2x^2 + 4x - 7 = 0$	1A standard form
		$x = \frac{-4 \pm \sqrt{4^2 - 4(2)(-7)}}{2(2)}$	1CA substitution into correct formula
		$x = 1{,}12$ or $x = -3{,}12$	2CA for each solution
			[4]

1.3		$\frac{(-2x+7)+5}{x-1}=\frac{1}{2}$	1A correct substitution
		$2(-2x+12)=x-1$	1CA simplification
		$x=5$	1CA
		Substitute $x=5$: $y=-2(5)+7$	
		$y=-3$	1CA
		OR	
		$\frac{y+5}{-\frac{y}{2}+\frac{7}{2}-1}=\frac{1}{2}$	1A correct substitution
		$2(y+5)=-\frac{y}{2}+\frac{5}{2}$	1CA simplification
		$y=-3$	1 CA
		substitute $y=-3$: $x=-\frac{-3}{2}+\frac{7}{2}$	
		$x=5$	1CA
			[4]
1.4		$1-p>0$	1A
		$p<1$	1CA **[2]**

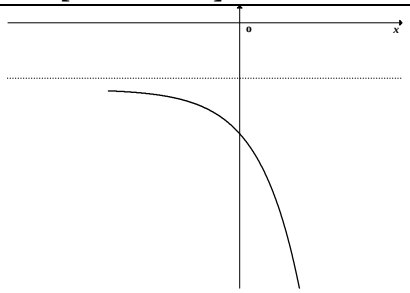
QUESTION 2 [12 MARKS]

2.1	2.1.1	$x\left(-\frac{x}{2}\right)$	1A for $-\frac{x}{2}$
		$=-\frac{x^2}{2}$	1CA for multiplication with x
			[2]
	2.1.2	$x+x+2$	1A for $x+2$
		$=2x+2$	1CA for adding to x
			[2]
2.2		$-2+x+2x+2=-\frac{x^2}{2}$	1M 1CA
		$x^2+6x=0$	1CA for simplified form
		$x(x+6)=0$	1CA factorizing
		$x=-6$	1CA choosing correct x-value
			[5]
2.3		The series does NOT converge.	1CA
		$r=3$. to converge, $-1<r<1$	2M for any logical explanation.
			[3]

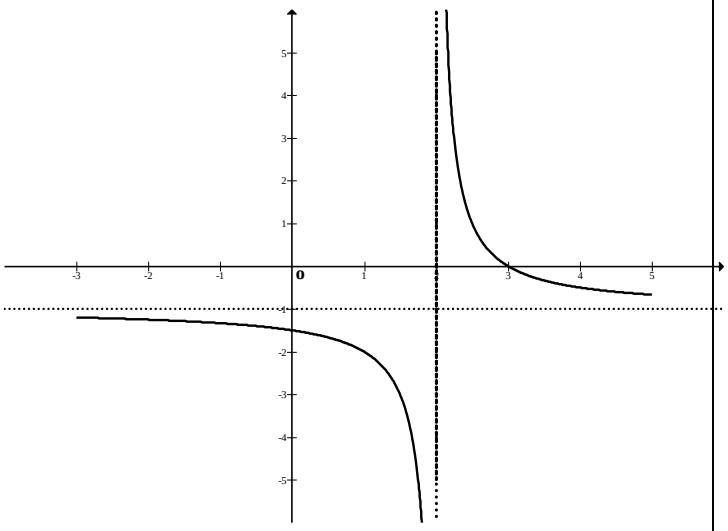
QUESTION 3 [8 MARKS]			
3.1		$(250)^2 + 4(250)$	1A substitution
		$= 6350$	1CA
			[2]
3.2		$T_{100} = S_{100} - S_{99}$	1M
		$= 100^2 + 4(100) - [99^2 + 4(99)]$	1A correct substitution
		$= 203$	1CA
		OR	
		$T_1 = 5\ ;\ T_2 = 7\ ;\ T_3 = 9$	1A for first three terms
		$T_{100} = 5 + 99(2)$	1M for correct formula
		$= 203$	1CA
			[3]
3.3		$n^2 + 4n = 1440$	1A
		$(n + 40)(n - 36) = 0$	1CA correct factors or correct substitution into correct formula.
		$n = 36$	1CA choice of correct n. Full marks for answer only
			[3]

QUESTION 4 [6 MARKS]			
4.1		2; 6; 12; 20	1A for first three terms
			1A for the 4^{th} term
			[2]
4.2		$a = 1;\quad b = 1;\quad c = 0$	3A finding a, b, c using any correct method.
		$T_n = n^2 + n$ or $T_n = n(n+1)$	
		$T_{100} = 100(100 + 1)$	
		$= 10100cm^2$	1CA
			[4]

QUESTION 5 [15 MARKS]			
5.1	5.1.1	$A = 650\,000(1-0,3)^4$	1A substitution into correct formula
		=R156 065	1CA
			[2]
	5.1.2	$A = 650\,000(1+0,15)^4$	1A substitution into correct formula
		= R1 136 854,06	1CA
			[2]
	5.1.3	$1136854,06 - 156\,065 = 980\,789,06$	1CA
		$980\,789,06 = \dfrac{x\left[\left(1+\dfrac{0,095}{12}\right)^{48}-1\right]}{\dfrac{0,095}{12}}$	1M for use of correct formula 1CA us of correct formula
		= R16 875,92	1CA
			[4]
5.2	5.2.1	$OB = 1275000\left(1+\dfrac{0,092}{12}\right)^{84} - \dfrac{11636,02\left[\left(1+\dfrac{0,092}{12}\right)^{84}-1\right]}{\dfrac{0,092}{12}}$	1M 1A correct substitution
		$= R1056\,675,39$	1CA
			[3]
	5.2.2	$1056675,39\left(1+\dfrac{0,092}{12}\right)^5$	1CA substitution into correct formula
		= R1097807,15	1CA
		$1097807,15 = \dfrac{x\left(1-\left(1+\dfrac{0,092}{12}\right)^{-151}\right)}{\dfrac{0,092}{12}}$	1CA substitution into correct formula
		= R12297,82	1CA
			[4]

QUESTION 6 [3 MARKS]			
			1M for correct shape 1A for horizontal asymptote 1A for negative *y*-value **[3]**

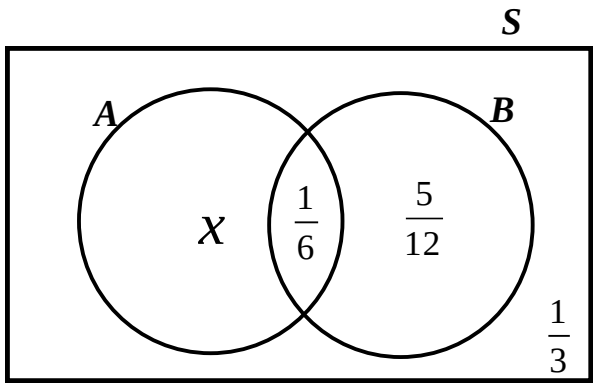
QUESTION 7 [19 MARKS]			
7.1		$-2x^2-4x+30=0$	1M equating to 0
		$(x+5)(x-3)=0$	1A correct factors
		$A(-5;0)$ $B(3;0)$	2CA for both intercepts -1 if not in coordinate form
			[4]
7.2		$y=-2(x^2+2x-15)$	1A for taking out -2
		$y=-2(x^2+2x+1-15-1)$	1CA $\left(\frac{b}{2}\right)^2$ added and deducted
		$y=-2[(x+1)^2-16]$	1CA in complete square form
		$y=-2(x+1)^2+32$	1CA
		Tpt $(-1;32)$	1CA
		OR	
		$x=-\frac{-4}{2(-2)}$	1A substitute into correct formula
		$x=-1$	1CA
		$y=32$	1CA
		$y=-2(x+1)^2+32$	1CA in correct form
		Tpt $(-1;32)$	1CA
			[5]
7.3		$y=-2(1)^2-4(1)+30$	1M substitution into equation
		$y=24$ - No	1CA value and conclusion
		OR	
		$-2x^2-4x+30=2x+10$	1M finding point of intersection
		$x^2+3x-10=0$	
		$x=2$ or $x=-5$ - No	1CA for values with conclusion
			[2]
7.4		$-2x^2-4x+30=mx+32$	1M for equating
		$-2x^2+(-4-m)x-2=0$	1CA for standard form
		$\Delta=0$	1M
		$(-4-m)^2-4(-2)(-2)=0$	1CA correct substitution
		$m=0$ or $m=-8$	2 CA for each value of m
			[6]
7.5		$(-\infty;3)-\{-5\}$ or $x<3;\ x\neq -5$	2A
			[2]

QUESTION 8 [11 MARKS]			
8.1		$VA:\ x=2$	1A
		$HA:\ y=-1$	1A
			[2]
8.2		y-intercept: $y=\frac{1}{0-2}-1$	1M
		$=-\frac{3}{2}$	1CA
		x-intercept: $\frac{1}{x-2}-1=0$	1M
		$x=3$	1CA
			[4]
8.3			1A intercepts with axes 1A asymptotes 1A Shape **[3]**
8.4		$2=\frac{1}{k-2}-1$	1A correct substitution
		$k=\frac{5}{3}$	1CA
			[2]

QUESTION 9		**[6 MARKS]**	
9.1		$-2 = \log_a\left(\frac{9}{4}\right)$	1A correct substitution
		$a^{-2} = \left(\frac{9}{4}\right)$	1CA exponential form
		$a = \frac{2}{3}$	1CA
			[3]
9.2		$y = -\log_{\frac{2}{3}} x$ or $y = l\log_{\frac{3}{2}} x$	1A
			[1]
9.3		$g(x) > -2$	1A
			[1]
9.4		$(-\infty; \infty)$	1A
			[1]
QUESTION 10		**[14 MARKS]**	
10.1	10.1.1	$\frac{f(3+h)-f(3)}{h}$	1M correct formula
		$= \frac{-2(3+h)^2+1-[-2(3)^2+1]}{h}$	1A correct substitution
		$= \frac{-12h-2h^2}{h}$	1CA correct simplification
		$= \frac{h(-12-2h)}{h}$	1CA
		$= -12-2h$	Max 1/3 if 'limit' is used
		OR	
		$\frac{f(x+h)-f(x)}{h}$	1M correct formula
		$= \frac{-2(x+h)^2+1-[-2x^2+1]}{h}$	1A correct substitution
		$= \frac{-4xh-2h^2}{h}$	1CA correct simplification
		$= \frac{h(-4(3)-2h)}{h}$	1CA substitution of $x = 3$
		$= -12-2h$	Max 1/3 if 'limit' is used
			[4]
	10.1.2	$\lim_{h\to 0}(12-2h)$	1M using limit
		$= 12$	1CA
			[2]
	10.1.3	$m = 0$	1A
			[1]

10.2	10.2.1	$y = 16 - 16x + 4x^2$	1A for simplification
		y' *or* $\frac{dy}{dx} = -16 + 8x$	2CA (-1 for incorrect notation)
			[3]
	10.2.2	$y = x - ax^{\frac{1}{2}} + a$	1A for simplification
		$y' = 1 - \frac{1}{2}ax^{-\frac{1}{2}}$	2CA
		$y' = 1 - \frac{a}{2x^{\frac{1}{2}}}$	1CA positive exponents
			[4]
QUESTION 11 [11 MARKS]			
11.1		The graph passes through the origin. Or $f(x) = (x-0)^2(x-a)^2$	1M any logical explanation
			[1]
11.2	11.2.1	$f(x) = x(x-2)^2$	1A factorization
		$a = 2$	1CA
			[2]
	11.2.2	$f'(x) = 0$	1M
		$3x^2 - 8x + 4 = 0$	1A correct differentiation
		$(3x-2)(x-2) = 0$	1CA factors
		$b = \frac{2}{3}$	1CA
			[4]
11.3		$f'(0) = 3(0)^2 - 8(0) + 4$	1CA substitution into derivative
		$m = 4$	1CA
			[2]
11.4		$x^3 - 4x^2 + 4x = p - 2$	1M taking 2 to RHS
		$p < 2$	1CA (full marks for answer only)
			[2]

QUESTION 12 [9 MARKS]			
12.1		$x^2\left(40-\frac{x}{3}\right)<0$	1M for inequality
		$x>120km/hour$	1A for inequality sign 1CA for 120*km/hour* Full marks if units are omitted.
			[3]
12.2		$P=40x^2-\frac{x^3}{3}$	
		$P'(x)=0$	1M
		$80x-x^2=0$	1CA
		$x(80-x)=0$	1CA correct factorization
		$x=80km/hour$	1CA
		$P=10(80)^2-\frac{80^3}{12}$	1CA
		$P=21333,33$ *Rand / day*	1CA Full marks if units are omitted.
			[6]

QUESTION 13 [15 MARKS]			
13.1		$\frac{1}{6}+\frac{7}{16}$	2A for both outcome 1M for addition
		$=\frac{29}{48}$	1CA for simplification
			[4]
13.2	13.2.1		3A for each section
			[3]
	13.2.2	$x+\frac{1}{6}+\frac{5}{12}+\frac{1}{3}=1$	1M
		$x=\frac{1}{12}$	1A
		$P(A)=\frac{1}{6}+\frac{1}{12}=\frac{1}{4}$	1CA
			[3]
13.3		36 000	1A
			[1]
13.4	13.4.1	2.9!	2A
			[2]
	13.4.2	8.8!	2A
			[2]