QUESTION 1				
1.1	1.1.1	$3(2x^2 - 5) = x$ $6x^2 - x - 15 = 0$ $(2x+3)(3x-5) = 0$ $x = -1\frac{1}{2}$ *or* $x = 1\frac{2}{3}$	[4]	✓standard form ✓factorising ✓✓answer
	1.1.2	$3x^2 + x - 5 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-1 \pm \sqrt{1 - 4(3)(-5)}}{2(3)}$ $= \frac{-1 \pm \sqrt{61}}{6}$ $x = \frac{-1 + 7{,}81}{6}$ *or* $x = \frac{-1 - 7{,}81}{6}$ $x = \frac{6{,}81}{6}$ *or* $x = \frac{-8{,}81}{6}$ $x = 1{,}14$ *or* $x = -1{,}47$	[5]	✓formula ✓substitution ✓simplification $\sqrt{61} = 7{,}810$ ✓✓x- values
	1.1.3	$\sqrt{x} - 1 = 5$ $\sqrt{x} = 6$ $x = 36$	[2]	✓transposing -1 ✓answer

1.2		$x^2 - 2xy + y^2 - 9 = 0$.....(1) $x - 2y = 1$ $x = 1 + 2y$......................(2) $sub\ \ (2)\, in\, (1)$ $(1+2y)^2 - 2y(1+2y) + y^2 - 9 = 0$ $1 + 4y + 4y^2 - 2y - 4y^2 + y^2 - 9 = 0$ $y^2 + 2y - 8 = 0$ $(y+4)(y-2) = 0$ $y = -4\ or\ y = 2$ $x = 1 + 2(-4); x = 1 + 2(2)$ $x = -7; x = 5$	[8]	✓making x the subject of the formula in linear equation ✓correct substitution ✓simplification ✓standard form ✓factorisation ✓y-values ✓✓x-values
		ALTERNATIVE SOLUTION: $x = 2y + 1$.................(1) $(x - y)^2 = 9$..............(2) $x - y = 3\ or\ -3$ $(2y+1) - y = 3\ or\ (2y+1) - y = -3$ $2y + 1 - y = 3\ or\ 2y + 1 - y = -3$ $y = 2\ or\ y = -4$ $x = 3 + 2\ or\ x = -3 - 4$ $x = 5\ or\ x = -7$	[8] **[19]**	✓factorising quadratic equation ✓✓simplifying quadratic equation ✓correct substitution ✓y- values ✓substitution ✓✓x- values
QUESTION 2				
2.1	2.1.1	*For real roots* $2p - 1 \geq 0$ $2p \geq 1$ $p \geq \frac{1}{2}$	[2]	✓statement ✓answer
	2.1.2	p can be anyone of $\frac{1}{2}$; 1, $\frac{5}{2}$, 5, $\frac{17}{2}$, 13,...	[2]	✓✓answer

2.2		$x^2 + x + 1 = 0$ $\Delta = b^2 - 4ac$ $= (1)^2 - 4(1)(1)$ $= -3$ $\Delta < 0$ Since $\Delta < 0$, roots are not real	[5] **[9]**	✓standard form ✓formula (Δ) ✓correct substitution ✓simplification ✓ Δ<0 (conclusion)
		QUESTION 3		
3.1		$f(x) = 2x^2 - mx - 4x + 10$ $f(3) = 2(3)^2 - m(3) - 4(3) + 10 = -2$ $\therefore 18 - 3m - 12 + 10 = -2$ $18 - 3m = 0$ $m = 6$	[4]	✓$f(3)$ ✓$= -2$ ✓simplification ✓answer
3.2		$f(x) = 2x^3 - ax + b$ $f(2) = 2(2)^3 - a(2) + b = 0$ $16 - 2a + b = 0$..................(1) $g(x) = x^3 - ax^2 - bx - 8$ $g(2) = (2)^3 - a(2)^2 - b(2) - 8 = 0$ $8 - 4a - 2b - 8 = 0$ $2a + b = 0$ $b = -2a$.......................(2) sub.(2) in (1) $16 - 2a + (-2a) = 0$ $4a = 16$ $a = 4$ $\therefore b = -2(4) = -8$	[6] **[10]**	✓$f(2)$ ✓$=0$ ✓equation (1) ✓equation (2) ✓value of a ✓value of b

QUESTION 4				
4.1	4.1.1	$y=+\sqrt{9-x^2}$ *or* $h(x)=\sqrt{9-x^2}$	[2]	✓ $y=\sqrt{r^2-x^2}$ ✓ $y=\sqrt{9-x^2}$
	4.1.2	$p=1$ $q=-4$	[2]	✓p- value ✓q- value
	4.1.3	$y=a(x-1)^2-4$ $0=a(3-1)^2-4$ $0=4a-4$ $a=1$	[4]	✓substitute (1; – 4) ✓substitute (3; 0) ✓simplification ✓answer
	4.1.4	$y\geq -4$	[2]	✓✓answer
4.2	4.2.1	$xy=k$ sub.$(-1;3)$: $k=(-1)(3)=-3$ $\therefore f(x)=-\frac{3}{x}$	[3]	✓equation ✓substitution ✓answer **Answer only: full marks**
	4.2.2	$y=mx+c$ $(-1;3): 3=-m+c$............(1) $(2;0)$: $0=2m+c$.............(2) $(1)-(2): 3=-3m$ $\therefore m=-1$ in $(1): 3=-(-1)+c$ $c=2$ equation *of* g : $y=-x+2$ *OR* $m_g=\frac{y_2-y_1}{x_2-x_2}$ $=\frac{3-0}{-1-2}$ $=-1$ $y=-x+c$....................(1) sub: (2;0) *in* (1) $0=-(2)+c$ $2=c$ $\therefore y=-x+2$	[5]	✓substitution (–1; 3) ✓substitution (2; 0) ✓$m=-1$ ✓$c=2$ ✓equation of g ✓formula for m ✓substitution ✓$m=-1$ ✓$c=2$ ✓equation of g
	4.2.3	$-1<x<0$	[2]	✓✓answer
			[20]	

QUESTION 5

5.1	5.1.1	$\frac{3^{2-x}-4\cdot 3^{-x}}{3^{-x+2}}$ $=\frac{3^2\cdot 3^{-x}-4\cdot 3^{-x}}{3^{-x}\cdot 3^2}$ $=\frac{3^{-x}(3^2-4)}{3^{-x}(3^2)}$ $=\frac{(3^2-4)}{(3^2)}$ $=\frac{5}{9}$	[4]	✓splitting factors ✓factors in brackets ✓simplification ✓answer
	5.1.2	$\frac{\log 9}{\log\left(\frac{1}{3}\right)}$ $=\frac{\log 3^2}{\log 3^{-1}}$ $=\frac{2\log 3}{-1\log 3}$ $=-2$	[4]	✓exp law: $\log 9 = \log 3^2$ ✓exp law: $\log\left(\frac{1}{3}\right)=\log 3^{-1}$ ✓log law: $\log a^b = b\log a$ ✓answer
	5.2.1	$\left(\frac{1}{2}\right)^{x-9}=4^{x+3}$ $(2^{-1})^{x-9}=(2^2)^{x+3}$ $2^{-x+9}=2^{2x+6}$ $\therefore -x+9=2x+6$ $-3x=-3$ $x=1$	[5]	✓✓writing as base 2 ✓exponential law ✓simplification ✓answer

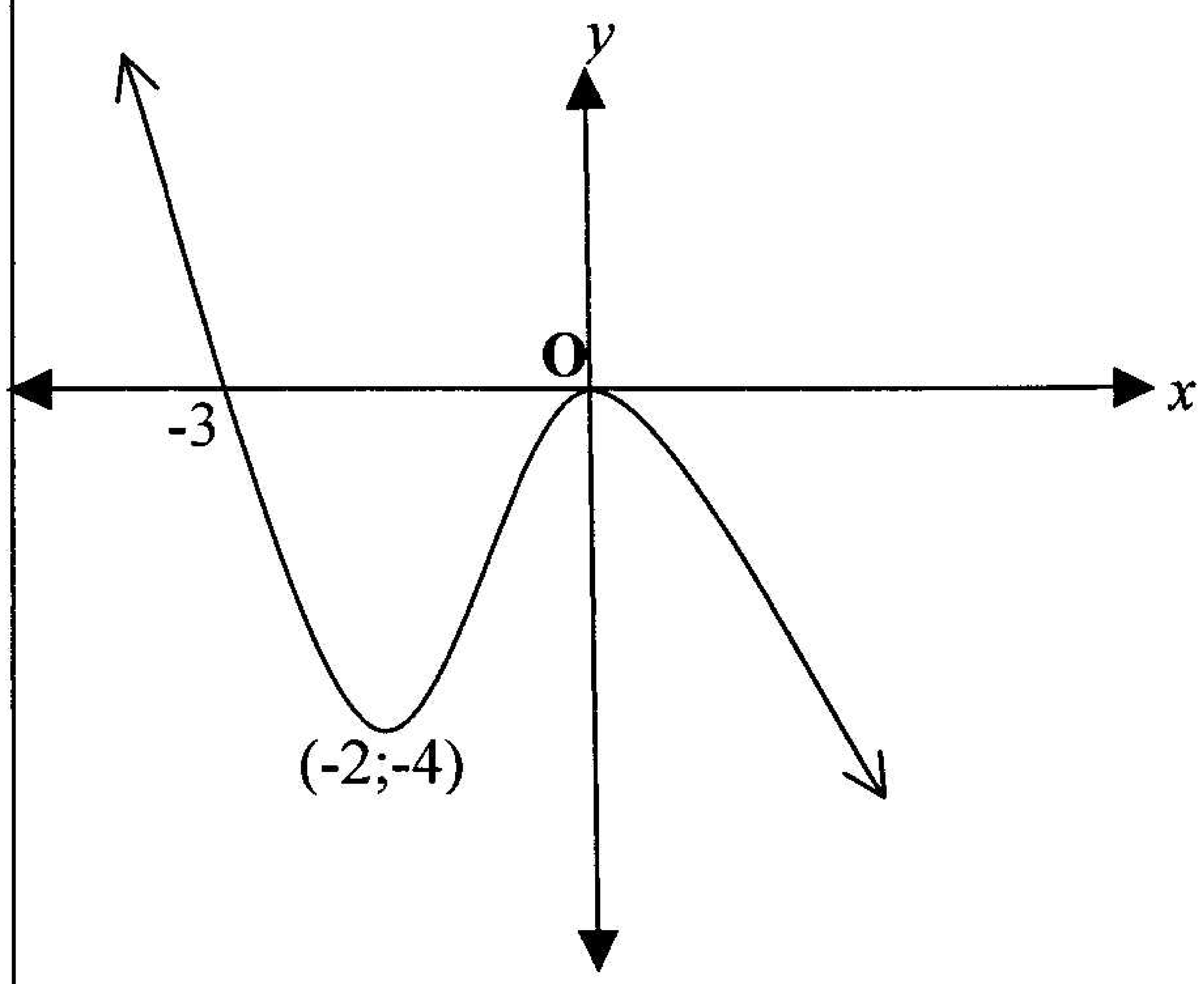
	5.2.2	$\log_4(x-1)+\log_4(x+2)=1$ $\log_4(x-1)(x+2)=1$ $\therefore (x-1)(x+2)=4$ $x^2+x-2=4$ $x^2+x-6=0$ $(x+3)(x-2)=0$ $\therefore x\neq -3$ $\therefore x=2$	[6]	✓log law (single log) ✓log law (removing log) ✓removing brackets ✓factorisation ✓ $x\neq -3$ ✓ $x=2$
5.3	5.3.1	$12^{x+1}=36(6^x)$ $12^x\cdot 12=36\cdot 6^x$ $\frac{12^x}{6^x}=\frac{36}{12}$ $\left(\frac{12}{6}\right)^x=3$ $2^x=3$	[3]	✓splitting factors ✓simplification(dividing by 6^x and 12 ✓exponential law
	5.3.2	$2^x=3$ $\log 2^x=\log 3$ $x\log 2=\log 3$ $x=\frac{\log 3}{\log 2}$ $x=1{,}54$ *or* $x=\log_2 3$ $=\frac{\log 3}{\log 2}$ $=1{,}54$	[3]	✓log law ✓x-subject ✓answer
			[25]	

		QUESTION 6		
6.1	6.1.1	$T_n=a+(n-1)d$ $T_n=401$ $\therefore a+(n-1)d=401$ $5+(n-1)4=401$ $5+4n-4=401$ $4n=400$ $\therefore n=100$ there are 100 terms	[4]	✓formula ✓equation ✓substitution ✓answer

	6.1.2	$S_n = \frac{n}{2}(a + T_n)$ $S_{100} = \frac{100}{2}(5 + 401)$ $= 50(406)$ $= 20300$	[3]	✓formula ✓substitution ✓answer
6.2	6.2.1	$18 - x = x - 2$ $2x = 20$ $x = 10$	[3]	✓ $T_2 - T_1 = T_3 - T_2$ (M) ✓simplification ✓answer
	6.2.2	$\frac{x}{2} = \frac{18}{x}$ $x^2 = 36$ $x = \pm 6$	[4]	✓ $\frac{T_2}{T_1} = \frac{T_3}{T_2}$ (M) ✓simplification ✓ ± ✓6
6.3	6.3.1	$T_1 = 3(2)^{1+1} = 3.2^2 = 12$ $T_2 = 3(2)^{1+2} = 3.2^3 = 24$ $T_3 = 3(2)^{1+3} = 3 \cdot 2^4 = 48$	[3]	✓value for T_1 ✓value for T_2 ✓value for T_3
	6.3.2	$12 + 24 + ... + 3.2^{11}$ $a = 12$ $r = 2$ $n = 10$ $S_{10} = \frac{a(1 - r^n)}{1 - r}$ $= \frac{12(1 - 2^{10})}{1 - 2}$ $= 12276$	[5]	✓✓✓value for *a,r,n* ✓formula ✓answer
6.4		$A = P\left(1 + \frac{r}{100}\right)^n$ $= 6530\left(1 + 1,25 \cdot \frac{1}{100}\right)^{18}$ $= 6530(1,0125)^{18}$ $= 8166,27$ ∴ Cost is R8166.27	[6]	✓formula ✓*P* ✓*n*=18 ✓r=1,25 ✓✓answer
			[28]	

QUESTION 7				
7.1		$f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $=\lim_{h\to 0}\frac{4(x^2+2xh+h^2)-4x^2}{h}$ $=\lim_{h\to 0}\frac{4x^2+8xh+4h^2-4x^2}{h}$ $=\lim_{h\to 0}\frac{8xh+4h^2}{h}$ $=\lim_{h\to 0}(8x+4h)$ $=8x$	[6]	✓formula ✓substitution ✓remove () ✓simplification ✓dividing by h ✓answer
7.2	7.2.1	$y=x^3-3x^{-1}$ $\frac{dy}{dx}=3x^2+3x^{-2}$	[3]	✓exponential form ✓✓each derivative
	7.2.2	$y=x^2-2x-3$ $\frac{dy}{dx}=2x-2$	[3]	✓remove brackets ✓✓each derivative
7.3	7.3.1	$y=2^2-1$ $=3$	[1]	✓answer
	7.3.2	$f'(x)=2x$ $f'(2)=4$ slope= 4	[3] **[16]**	✓derivative ✓substitution ✓answer

QUESTION 8				
8.1	8.1.1	$f(x)=-x^3-3x^2$ $-x^2(x+3)=0$ $x=0 \text{ or } x=-3$ y- intercept = 0	[3]	✓factors ✓ = 0 ✓x-intercept y- intercept
	8.1.2	$f'(x)=0$ $-3x^2-6x=0$ $-3x(x+2)=0$ $x=0 \text{ or } x=-2$ $y=0 \text{ or } y=-4$	[6]	✓$f'(x)=0$ ✓derivative ✓factors ✓x-values ✓✓y-values

	8.1.3		[4]	✓x-intercepts ✓✓TP's ✓shape
	8.1.4	$-2<x<0$ *or* $-2\leq x\leq 0$	[2]	✓✓answer
8.2	8.2.1	$l=(x-2)\ cm$ $b=52-x-2=(50-x)\ cm$	[2]	✓l ✓ b
	8.2.2	$A=l\times b$ $A=(x-2)(50-x)$ $=50x-x^2-100+2x$ $A=-x^2+52x-100$	[2]	✓formula ✓multiplication
	8.2.3	$A'(x)=-2x+52=0$ $-2x=-52$ $x=26$ $A=-x^2+52x-100$ $A=(26)^2+52(26)-100$ $A=1928\ cm^2$	[4]	✓derivative ✓=0 ✓substitution ✓answer
			[23]	