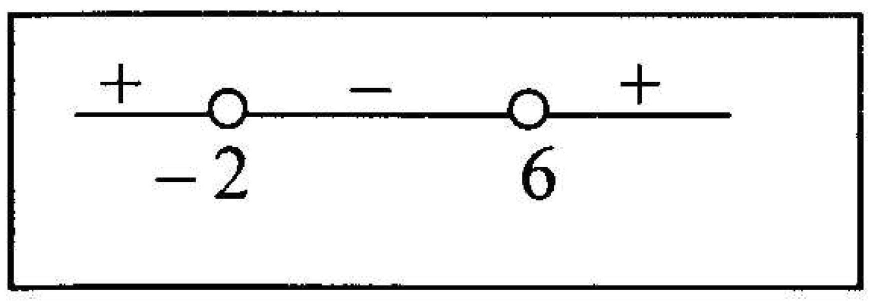
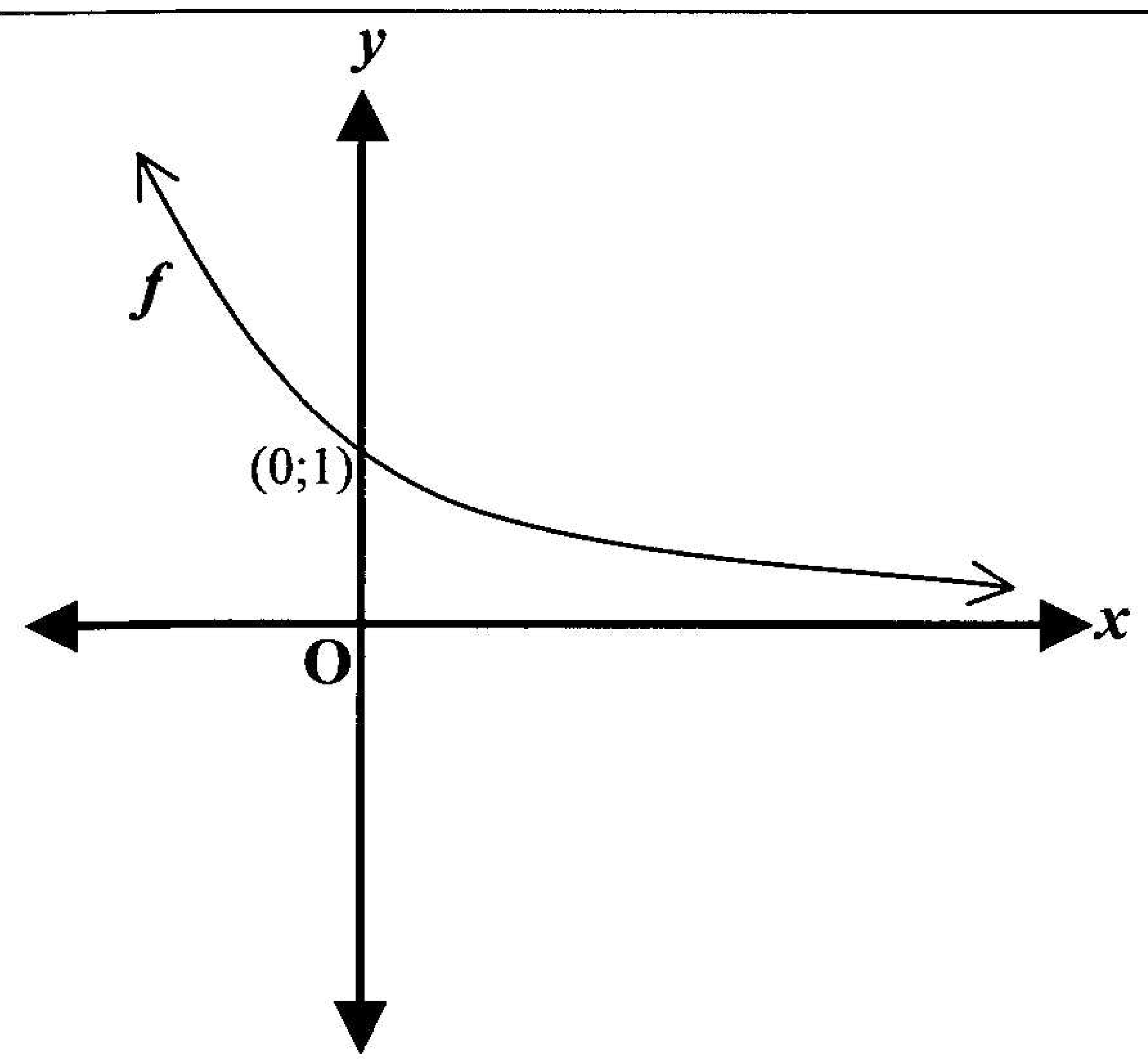
1.1	1.1.1	$-3x^2+5x+2=0$ $-(3x+1)(x-2)=0$ $x=-\frac{1}{3}$ or $x=2$	(2)	✓ factors ✓ both answers
	1.1.2	$\lvert x+3\rvert<9$ $-9<x+3<9$ $-12<x<6$ **OR** $(\lvert x+3\rvert)^2<9^2$ $x^2+6x+9<81$ $x^2+6x-72<0$ $(x+12)(x-6)<0$ $-12<x<6$	(3)	✓ inequality ✓ ✓ answer (accept answer only) ✓ factors ✓✓ answer
	1.1.3	$x-7-\sqrt{x-5}=0$ $x-7=\sqrt{x-5}$ $(x-7)^2=(\sqrt{x-5})^2$ $x^2-14x+49=x-5$ $x^2-15x+54=0$ $(x-6)(x-9)=0$ $x\neq 6$ or $x=9$	(6)	✓ transposing ✓ square both sides ✓ both squares ✓ standard form ✓ factors ✓ reject 6 ✓ accept 9
	1.1.4	$4(2^x)+3=\frac{1}{2^x}$ Let $k=2^x$ $\therefore\ 4k+3=\frac{1}{k}$ $4k^2+3k-1=0$ $(4k-1)(k+1)=0$ $2^x=\frac{1}{4}$ or $2^x=-1$ (no solution) $\therefore\ x=-2$	(5)	✓ standard form ✓ factors ✓ $2^x=\frac{1}{4}$ ✓ $x=-2$ ✓ no solution

1.2	1.2.1	$(x-2)(x-k)=-4$ $x^2 - xk - 2x + 2k + 4 = 0$ $x^2 - (k+2)x + 2k + 4 = 0$ $\Delta = b^2 - 4ac$ $= (-k-2)^2 - 4(1)(2k+4)$ $= k^2 + 4k + 4 - 8k - 16$ $= k^2 - 4k - 12$ $= (k-6)(k+2)$ For real roots: $\Delta \geq 0$ $\therefore\ k \leq -2$ or $k \geq 6$ **OR** $x^2 - (k+2)x + 2k + 4 = 0$ $\Delta = b^2 - 4ac$ For real roots: $\Delta \geq 0$ $\Delta = (-k-2)^2 - 4(1)(2k+4)$ $= (k+2)^2 - 8(k+2)$ $= (k+2)[k+2-8]$ $= (k+2)(k-6)$ $\therefore\ (k+2)(k-6) \geq 0$ 	(7)	✓ remove brackets ✓ standard form ✓ formula ✓ substitution into form. ✓ $\Delta \geq 0$ ✓✓ solution ✓ remove brackets ✓ $\Delta \geq 0$ ✓ substitution into form ✓ simplification ✓ factorisation ✓✓ solution
	1.2.2	For example $k = 7$ or -3	(3)	✓✓ ✓ value of k (M & A)

1.3	1.3.1	Let the number of workers be x and daily wage per worker be y $xy = 5\ 880$ $\therefore \quad y = \frac{5\ 880}{x}$ ....(1) $(x-4)(y+10) = 5\ 850$ ....(2) $xy - 4y + 10x = 5\ 850$ **OR** $5\ 880 - 4\left(\frac{5\ 880}{x}\right) + 10x = 5\ 850$ *etc* **Substitute (1) in (2):** $(x-4)\left(\frac{5\ 880}{x} + 10\right) = 5\ 850$ $5\ 880 + 10x - \frac{2\ 3520}{x} - 40 = 5\ 850$ $10x^2 - 10x - 23\ 520 = 0$ $10(x+48)(x-49) = 0$ $x = -48 \quad \text{or} \quad x = 49$ $\therefore$ Trevor employs 49 workers.	(7)	✓ current wage-bill ✓ new wage-bill ✓ substitution ✓ standard form ✓ factors ✓ both answers ✓ solution
		OR: $\frac{5\ 850}{x-4} - \frac{5\ 880}{x} = 10$ $5\ 850x - 5\ 880x + 23\ 520 = 10x^2 - 40x$ $10x^2 - 10x - 23\ 520 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{10 \pm \sqrt{10^2 + 4(10)(23\ 520}}{20}$ $= 49 \text{ or } -48$ $\therefore \quad x = 49$		✓✓ setting up equation ✓ multiply by LCD ✓ std form ✓ formula ✓ substitution ✓ answer
	1.3.2	$y = \frac{5\ 880}{49}$ $= 120$ Each worker earns R120 per day.	(2)	✓ substitution ✓ answer
			[35]	

2.1	$g(x) = \lvert x \rvert - 3$			
	2.1.1	$\lvert x \rvert - 3 = 0$ $\therefore x = 3$ or $x = -3$ $A(-3;0)$	(2)	✓ x-co-ordinates of A ✓y-co-ordinates of A [Answer only: full marks]
	2.1.2	$y = -(x-1)^2 + q$ $0 = -(-3-1)^2 + q$ $= -16 + q$ $q = 16$ $\therefore y = -x^2 + 2x - 1 + 16$ $= -x^2 + 2x + 15$ **OR** $\frac{-b}{-2} = 1$ $\therefore b = 2$ $f(x) = -x^2 + 2x + c$ $0 = 1 - (-3)^2 + 2(1-3) + c$ $c = 15$	(5)	✓✓ subst. axis of symmetry ✓ subst. co-ordinates of A ✓ value of q ✓ simplification ✓ axis of symmetry ✓ value of b ✓✓ substitute point $(0;-3)$ ✓ value of c
	2.1.3	(a) $RS = (-x^2 + 2x + 15) - (x-3)$ $= -x^2 + x + 18$	(3)	✓✓ equation on RS ✓ answer
	2.1.3	(b) $\frac{dRS}{dx} = 0$ $1 - 2x = 0$ $x = \frac{1}{2}$ $\therefore f(\frac{1}{2}) = -\frac{1}{4} + \frac{2}{2} + 15$ $= 15\frac{3}{4}$ **OR** $x = \frac{-b}{2a} = \frac{-1}{-2} = \frac{1}{2}$ $y = 15\frac{3}{4}$ $\therefore R\left(\frac{1}{2};15\frac{3}{4}\right)$	(5)	✓ derivative of RS $= 0$ ✓ value of x ✓ substitute x ✓✓ answer ✓ formula ✓ value of x ✓ substitution ✓✓ value of y
2.2	2.2.1	$k = 4.3 = 12$ $r^2 = 4^2 + 3^2$ $= 25$ $\therefore r = 5$ $m = 1$ $\therefore y = x + c$ $3 = 4 + c$ $c = -1$	(6)	✓ value of k ✓ substitution ✓ value of r ✓ value of m ✓ substituting (4;3) ✓ value of c
	2.2.2	$Q(3;4)$	(2)	✓✓ (1 per co-ordinate)

2.3		$S\left(\frac{1}{2};\frac{1}{2}\right)$, $f(x)=a^x$		
	2.3.1	$\frac{1}{2}=a^{\frac{1}{2}}$ $a=\left(\frac{1}{2}\right)^2$ $=\frac{1}{4}$	(2)	✓ substitution ✓ square both sides
	2.3.2	$y=\left(\frac{1}{4}\right)^x$ $x=\left(\frac{1}{4}\right)^y$ $y=\log_{\frac{1}{4}}x$ **OR** $y=-\log_4 x$ **so** $f^{-1}(x)=\log_{\frac{1}{4}}x$	(2)	✓ interpretation ✓ answer
	2.3.3	$\left.\begin{array}{r}-\log_4 x=-\frac{3}{2}\\ \log_4 x=\frac{3}{2}\end{array}\right\}$ $x=4^{\frac{3}{2}}$ $=8$ **OR:** $f^{-1}(x)=-\frac{3}{2}$ $\therefore\ x=f(-\frac{3}{2})$ ✓ $=\left(\frac{1}{4}\right)^{-\frac{3}{2}}$ $=\left(\frac{1}{2}\right)^{-3}$ ✓ $=8$ ✓	(3)	✓ equating to – 1,5 ✓ exponential form ✓ answer
	2.3.4		(2) **[30]**	✓ form/ shape ✓ intercept

3.1	$f(-2)=(-2)^3+a(-2)^2+b=0$ $\therefore\quad -8+4a+2b=0$ ....(1) $g(-2)=(-2)^3+a(-2)-4b=0$ $\therefore\quad -8-2a-4b=0$ ....(2) $(1)\times 2:\quad -16+8a+4b=0$ ....(3) $(2)+(3):\quad -24+6a=0$ $a=4$ Subst. $a=4$ in (1): $-8+4(4)+2b=0$ $2b=-8$ $b=-4$	(5)	✓ susbt. by -2 ✓ factor theorem (= 0) ✓ substitution. & = 0 ✓ value of a ✓ value of b
3.2	$f(x)=(x+k).q(x)-12$ $f(3)=0$ $\therefore\quad (k+3).q(3)-12=0\quad ;\ q(3)=3$ i.e. $(k+3)(3)-12=0$ $\Rightarrow\quad k+3=4$ $\therefore\quad k=1$	(4) **[10]**	✓ factor theorem $f(3)=0$ ✓ substitution $x=3$ ✓ remainder theorem ✓ value of k

4.1	4.1.1	$\sqrt[3]{(\sqrt{13}-\sqrt{5})^6}.\sqrt[3]{(\sqrt{13}+\sqrt{5})^6}$ $=(\sqrt{13}-\sqrt{5})^2.(\sqrt{13}+\sqrt{5})^2$ $=[(\sqrt{13}-\sqrt{5})(\sqrt{13}+\sqrt{5})]^2$ $=(13-5)^2$ $=8^2=64$	(4)	✓ remove $\sqrt[3]{\ }$ ✓ exponential law ✓ simplification ✓ answer
	4.1.2	$3\log\sqrt[3]{40}-2\log\frac{1}{5} = 3\log 40^{\frac{1}{3}}$ ✓ $-2\log\left(\frac{1}{5}\right)$ $=\log 40-\log\left(\frac{1}{5}\right)^2$ ✓ $=\log\frac{40}{\left(\frac{1}{5}\right)^2}$ ✓ $=\log 1\,000=3$ ✓	(4)	✓ log law ✓ log law ✓ log law ✓ answer

4.2	4.2.1	$3^{x+1} - 3^{x-1} = 24\sqrt{3}$ $3^x\left(3 - \frac{1}{3}\right) = 24\sqrt{3}$ $3^x.\frac{8}{3} = 8.3.3^{\frac{1}{2}}$ $3^x = 8.3^{1\frac{1}{2}}.\frac{3}{8}$ $= 3^{2\frac{1}{2}}$ $\therefore \quad x = 2\frac{1}{2}$ **OR:** $3^x = \dfrac{24\sqrt{3}}{3 - \frac{1}{3}}$ ✓ $= 9\sqrt{3}$ $= 3^{\frac{5}{2}}$ ✓ $\therefore \quad x = \frac{5}{2}$ ✓	(5)	✓ factorisation ✓ correct term in ( ) ✓ write with base 3 ✓ 3^x subject of formula ✓ answer
	4.2.2	$7^x = 126\,(5^x)$ $x = \log_{\frac{7}{5}} 126$ $= \dfrac{\log 126}{\log 7 - \log 5}$ $= 14{,}37$ **OR** $\left(\frac{7}{5}\right)^x = 126$ ✓ $x \log\left(\frac{7}{5}\right) = \log 126$ ✓ $y = \dfrac{\log 126}{\log(1{,}4)} = 14{,}37$ ✓	(3)	✓ log form ✓ log law ✓ answer
4.3		RTP: $\log_{\frac{1}{a}} x = -\log_a x$ LHS $= \dfrac{\log x}{\log \frac{1}{a}}$ $= \dfrac{\log x}{\log a^{-1}}$ $= -\dfrac{\log x}{\log a}$ $= -\log_a x$ = RHS **OR** Let $y = \log_{\frac{1}{a}} x$ $\therefore \left(\frac{1}{a}\right)^y = x$ ✓ $x = a^{-y}$ ✓ $-y = \log_a x$ ✓ $y = -\log_a x$	(3)	✓ change of base ✓ log law ✓ log law
4.4		$\log_{10}(2x-5) \leq \log_{\frac{1}{10}}(x-3)$ $\log_{10}(2x-5) \leq -\log_{10}(x-3)$ $\log_{10}(2x-5) + \log_{10}(x-3) \leq 0$ $\log_{10}(2x-5)(x-3) \leq 0$ $(2x-5)(x-3) \leq 1$ $2x^2 - 11x + 15 - 1 \leq 0$ $2x^2 - 11x + 14 \leq 0$ $(2x-7)(x-2) \leq 0$ $2 \leq x \leq \dfrac{7}{2}$ and by definition $x > 3$ and $x > 2\frac{1}{2}$ $\therefore \quad 3 < x \leq \frac{7}{2}$	(9) **[29]**	✓ base 10: RHS ✓ single log ✓ exponential form ✓ standard form ✓ factors ✓✓ answer ✓ use definition ✓ solution

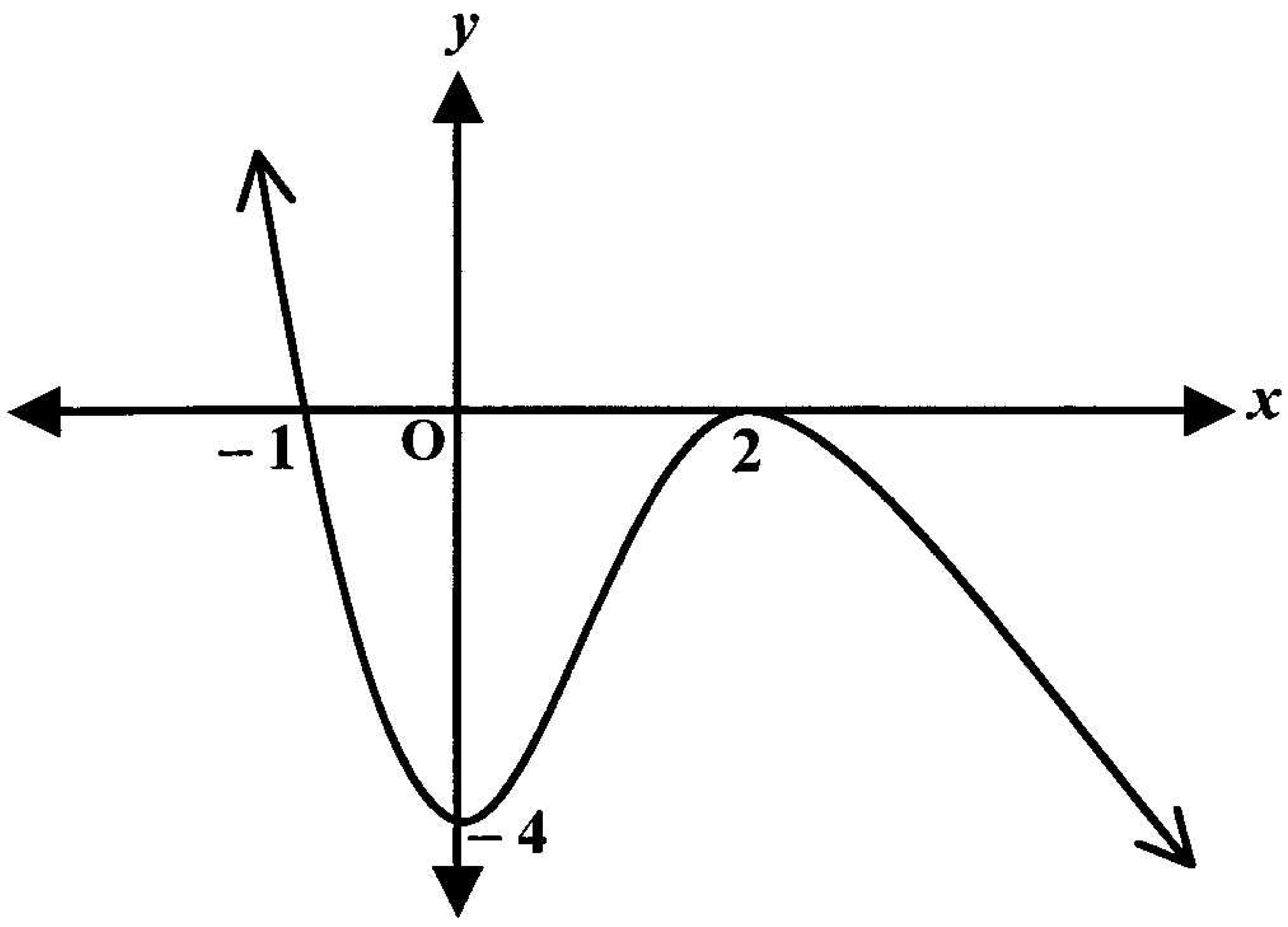
5.1		$S_n = \frac{n}{2}[2a + (n-1)d]$ $1\,275 = \frac{50}{2}(2a + 49d)$ $\therefore\ 2a + 49d = 51$ .... (1) $T_n = a + (n-1)d$ $T_{25} + T_{26} = (a + 24d) + (a + 25d)$ $= 2a + 49d$ $= 51$ [from eq. (1)]	(6)	✓ formula S_n ✓ substitution ✓ simplification ✓ formula T_n ✓ substitution ✓ answer
5.2	5.2.1	$S_n = \frac{3n^2 \quad n}{2}$ $S_{10} = \frac{3(10)^2 - 10}{2}$ $= 145$	(2)	✓ substitution ✓ answer
	5.2.2	$\sum_{r=5}^{10} T_r = S_{10} - S_4$ $= 145 - \frac{3(4)^2 - 4}{2}$ $= 145 - 22$ $= 123$	(3)	✓ equation ✓ substitution ✓ answer
5.3	5.3.1	$S_n = \frac{a(r^n - 1)}{r - 1}$ $S_4 = 5S_2$ $\frac{3(r^4 - 1)}{r - 1} = 5\left[\frac{3(r^2 - 1)}{r - 1}\right]$ $r^4 - 5r^2 + 4 = 0$ $(r^2 - 1)(r^2 - 4) = 0$ $r = 2$ $GS = 3; 6; 12; \ldots$	(7)	✓ formula ✓interpretation ✓ substitution ✓standard form ✓factorisation ✓value of r ✓answer
5.3	5.3.2	$765 = \frac{3(2^n - 1)}{2 - 1}$ $255 = 2^n - 1$ $2^n = 256$ $n = 8$	(4)	✓ $S_n = 765$ ✓ $\frac{3(2^n - 1)}{2 - 1}$ ✓ simplification ✓answer

5.4	$a = m;\quad r = \frac{6}{m};\quad S_\infty = 25$ $S_\infty = \frac{a}{1-r}$ $25 = \frac{m}{1-\frac{6}{m}}$ $25\left(1-\frac{6}{m}\right) = m$ $\frac{25m-150}{m} = m$ $m^2 = 25m-150$ $m^2 - 25m + 150 = 0$ $(m-10)(m-15) = 0$ $m = 10$ or $m = 15$ $r = \frac{6}{10},\quad -1 < r < 1$ $r = \frac{6}{15},\quad -1 < r < 1$ $\therefore$ both acceptable	(7) **[29]**	✓ value of r ✓ formula ✓ substitution ✓ standard form ✓ factors ✓ both values ✓ checking

6.1	$\lim_{h\to 4}\frac{h^2-h-12}{16-h^2} = \lim_{h\to 4}\frac{(h-4)(h+3)}{(4-h)(4+h)}$ $= \lim_{h\to 4} -\frac{h+3}{4+h}$ $= -\frac{7}{8}$	(3)	✓ factors ✓ simplification ✓ answer
6.2	$f(x) = -\frac{x^2}{2} + x$		
6.2.1	$f(x+h) - f(x) = -\frac{(x+h)^2}{2} + (x+h) + \frac{x^2}{2} - x$ $= \frac{-x^2 - 2xh - h^2 + 2x + 2h + x^2 - 2x}{2}$ $= \frac{h(-2x-h+2)}{2}$ $\frac{f(x+h)-f(x)}{h} = \frac{-2x-h+2}{2}$ $f(x+h)-f(x) = \frac{-2xh-h^2+2h}{2}$ $\therefore\ f'(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $= \frac{-2x+2}{2}$ $= -x+1$	(6)	✓ substitution ✓ simplification ✓ take out common factor ✓ simplification ✓ formula ✓ answer

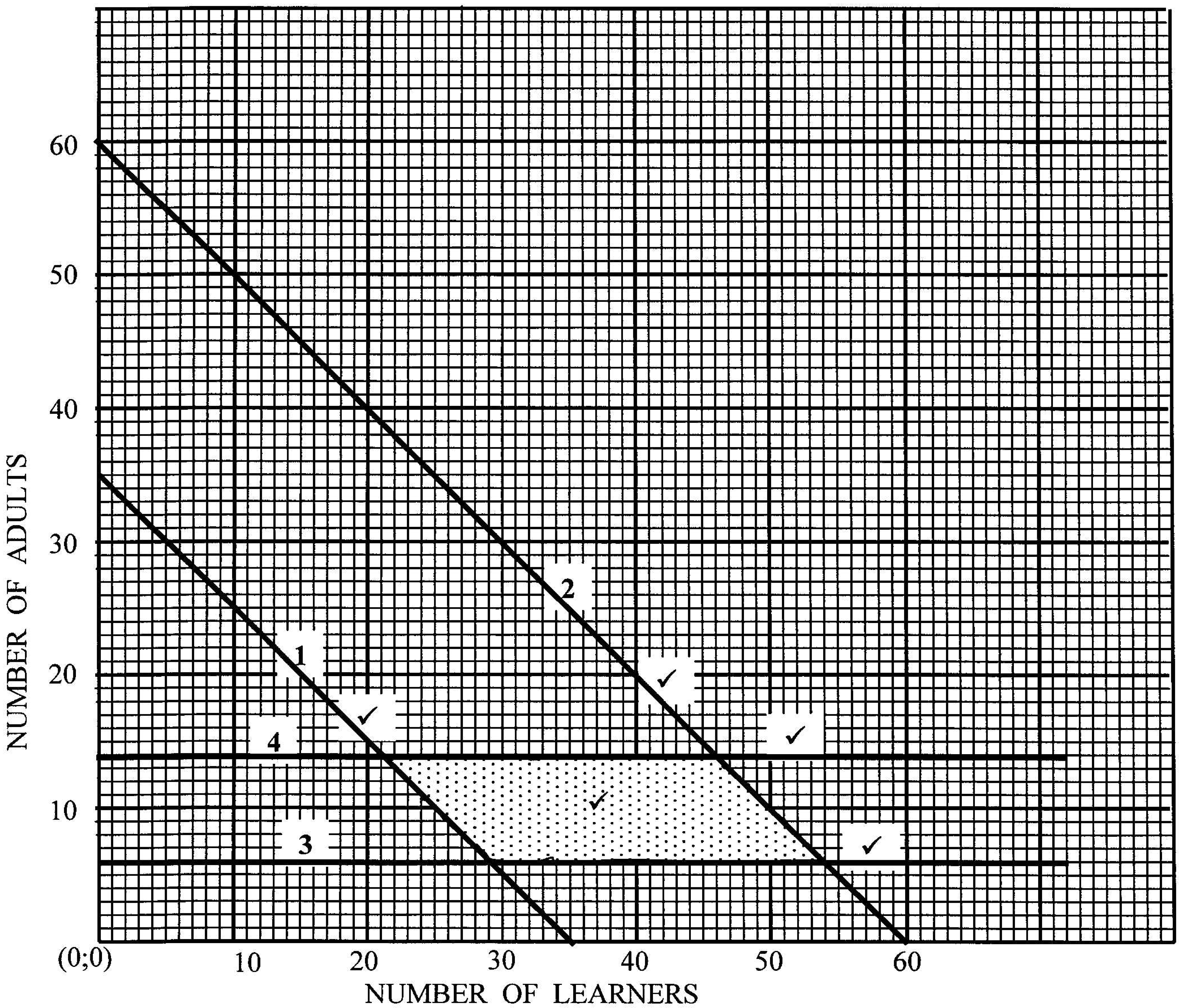
	6.2.2	$\lim\limits_{h \to 0} \dfrac{f(1+a)-f(1)}{h} = f'(1)$ $= 0$	(2)	✓ substitute x by 1 ✓ answer
	6.2.3	$f'(x) = -5$ $\therefore \quad -x+1 = -5$ $x = 6$ $y = -\dfrac{x^2}{2} + x$ At $x = 6$: $y = -\dfrac{(6)^2}{2} + (6) = -12$ $y-(-12) = -5(x-6)$ $0+12 = -5(a-6)$ $\therefore \quad a = \frac{18}{5}$	(6)	✓ knows that $f'(x) = -5$ ✓ value of x ✓ y-co-ordinate ✓ substitute point (6 ;– 12) ✓ substitute point (a ; 0) ✓ answer
6.3		$y = \dfrac{5x^5 - 6x^{\frac{3}{2}} + 5}{x}$ $= 5x^4 - 6x^{\frac{1}{2}} + 5x^{-1}$ $\dfrac{dy}{dx} = 20x^3 - 3x^{-\frac{1}{2}} - 5x^{-2}$	(5) **[21]**	✓✓ simplified y ✓✓✓ derivative (1 each derivative)

7.1		$f(x) = -x^3 + 3x^2 - 4$		
	7.1.1	$f(0) = -4 \quad \therefore \quad (0;-4)$ $f(-1) = 1+3-4 = 0$ $\therefore \; x+1$ is a factor of $f(x)$ $f(x) = 0$ $-(x+1)(x^2-4x+4) = 0$ $-(x+1)(x-2)^2 = 0$ $x = -1$ or $x = 2$ i.e. $(-1;0)$ and $(2;0)$	(7)	✓ y-intercept ✓ $f(-1) = 0$ ✓ linear factor ✓✓ quadratic factor ✓ all linear factors ✓ both values
	7.1.2	$f'(x) = 0$ $-3x^2 + 6x = 0$ $-3x(x-2) = 0$ $x = 0$ or $x = 2$ $y = -4$ or $y = 0$	(5)	✓ derivative ✓ $= 0$ ✓ both values of x ✓✓ values of y

	7.1.3		(4)	✓ y-intercept / TP ✓ x-intercept ✓ TP ✓ shape
	7.1.4	0	(1)	✓ answer
	7.1.5	1	(1)	✓ answer

7.2	$A=\frac{1}{2}xy$ $=\frac{1}{2}y(18-2y)$ $=9y-y^2$ $\frac{dA}{dy}=0$ $9-2y=0$ $y=4\frac{1}{2}$ $x=9$ $\therefore\ P\left(9;4\frac{1}{2}\right)$ **OR** $A=\frac{1}{2}x\left(9-\frac{1}{2}x\right)$ $=\frac{9}{2}x-\frac{1}{4}x^2$ $\frac{dA}{dx}=0$ $\frac{9}{2}-\frac{1}{2}x=0$ $x=9$ $y=4\frac{1}{2}$	(8)	✓ ✓ area of Δ ✓ in terms of x or y ✓ simplification ✓ derivative ✓ $=0$ ✓ value of x or y ✓ the other coordinate

8.1	$x+y\leq 60$ ....(1) $x+y\geq 35$ ....(2) $y\geq 6$ ....(3) $y\leq 14$ ....(4)	(5)	✓ equation (1) ✓✓ equation (2) ✓ equation (3) ✓ equation (4)
8.2	10 adults	(1)	✓ answer
8.3	51 learners	(1)	✓ answer
8.4	$T=30x+50y$ $\therefore$ each learners pays R30	(2)	✓✓ answer



8.5	**See graph paper above**	(5)	✓ ✓✓✓ (1 per line) ✓ feasible region
8.6	29 learners and 6 adults **OR** (29;6)	(3)	✓ learners ✓ adults
		[17]	

TOTAL : 200