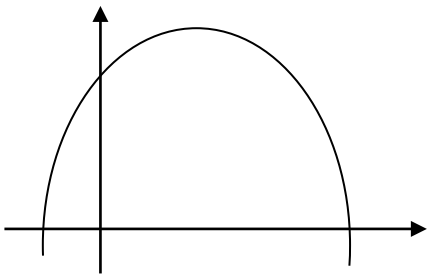
Question number		Scheme	Marks
1.	(a)	$4x(x+3)$ *or* $x(4x+12)$ (or use of quadratic formula)	M1
		$x=0$ $x=-3$	A1 A1 (3)
	(b)	Using $b^2-4ac=0$ $144-16c=0$ $c=9$	M1 A1
		$(2x+3)(2x+3)=0$ $x=\ldots$ (or quadratic formula)	M1
		$x=-\frac{3}{2}$	A1 (4)
			(7 marks)
2.	(a)	$u_2=\sqrt{\left(\frac{3}{2}+\frac{20}{3}\right)}$ $=2.85773\ldots$ $=\underline{\underline{2.86}}$	M1
		$u_3=$ 2.90300… $=\underline{\underline{2.90}}$	A1 c.a.o
		$u_4=$ 2.88806…. $=\underline{\underline{2.89}}$	A1 c.a.o
		[If u_3 = AWRT 2.90 and u_4 = AWRT 2.89 penalise once only]	(3)
	(i)	$3=\sqrt{\left(\frac{3}{2}+\frac{a}{3}\right)}$ or $9=\frac{3}{2}+\frac{a}{3}$	M1
		$\frac{a}{3}=9-\frac{3}{2}$ or $a=3\left(9-\frac{3}{2}\right)$	M1
		$a=22.5$	A1 (3)
	(ii)	(If $u_1=u_2$, then $u_2=u_3$……..) $u_5=\underline{\underline{3}}$	B1 (1)
			(7 Marks)

Question number	Scheme	Marks
3. (*a*)	$\frac{dy}{dx} = 4x^3 - 16x$	M1 A1 (2)
(*b*)	$x = 1$: $y = 1 - 8 + 3 = -4$	B1
	At $x = 1$, $\frac{dy}{dx} = 4 - 16 = -12$ (*m*)	B1 ft
	Gradient of normal = $-\frac{1}{m}$ $\left(= \frac{1}{12}\right)$	M1
	$y - (-4) = \frac{1}{12}(x - 1)$ $x - 12y - 49 = 0$	M1 A1
		(7 marks)
4. (*a*)	$2x + 2(x + 20) < 300$ (Using $x - 20$ is A0)	M1 A1 (2)
(*b*)	$x(x + 20) > 4800$ (Using $x - 20$ is A0)	M1 A1 (2)
(*c*)	65 (i.e. Allow wrong inequality sign or $x = 65$).	B1ft
	3 term quadratic, $(x + 80)(x - 60) = 0$ $x = \ldots$	M1
	$x > 60$	A1
	($x < -80$ may be included here, but there must be no other wrong solution to the quadratic inequality such as $x > -80$)	
	$60 < x < 65$	A1 (4)
		(8 marks)

Question number	Scheme	Marks
5. (*a*)	$\sqrt{8} = 2\sqrt{2}$ seen or used somewhere (possibly implied).	B1
	$\frac{12}{\sqrt{8}} = \frac{12\sqrt{8}}{8}$ or $\frac{12}{2\sqrt{2}} = \frac{12\sqrt{2}}{4}$	M1
	Direct statement, e.g. $\frac{6}{\sqrt{2}} = 3\sqrt{2}$ (no indication of method) is M0.	
	At $x = 8$, $\frac{dy}{dx} = 3\sqrt{8} + \frac{12}{\sqrt{8}} = 6\sqrt{2} + 3\sqrt{2} = 9\sqrt{2}$ (*)	A1 (3)
(b)	Integrating: $\frac{3x^{3/2}}{(3/2)} + \frac{12x^{1/2}}{(1/2)} (+C)$ (C not required)	M1 A1 A1
	At (4, 30), $\frac{3\times 4^{3/2}}{(3/2)} + \frac{12\times 4^{1/2}}{(1/2)} + C = 30$ (C required)	M1
	$(f(x) =)\ 2x^{3/2} + 24x^{1/2}, -34$	A1, A1 (6)
		(9 Marks)
6. (*a*)	$S = a + (a + d) + (a + 2d) + \ldots + [a + (n - 1)d]$	B1
	$S = [a + (n - 1)d] + [a + (n - 2)d] + \ldots + a$	M1
	Add: $2S = n[2a + (n - 1)d] \Rightarrow S = \frac{1}{2}n[2a + (n - 1)d]$	M1 A1 (4)
	$a = 54000$ and $n = 9$	B1
(*b*)	$619200 = \frac{1}{2} \times 9 \times (2 \times 54000 + 8d)$	M1 A1ft
	$d = 3700$	A1 (4)
(*c*)	$a + (n - 1)d = a + 10d = 54000 + 10d =$ £91000	M1 A1 (2)
		(8 marks)

Question number		Scheme	Marks
7.	(*a*)	Mid-point of $AB = [\frac{1}{2}(-3+8), \frac{1}{2}(-2+4)], = (\frac{5}{2}, 1)$	M1, A1 (2)
	(*b*)	$M_{AB} = \dfrac{4-(-2)}{8-(-3)}, = \dfrac{6}{11}$	M1, A1
		Equation of AB: $y-4 = \dfrac{6}{11}(x-8)$	M1
		$\Rightarrow 11y-44 = 6x-48, \quad \Rightarrow 6x-11y-4=0$ (or equivalent)	A1 (4)
	(*c*)	Gradient of tangent $= -\dfrac{11}{6}$	B1 ft
		Equation: $y-4 = -\dfrac{11}{6}(x-8)$ (or $6y+11x-112=0$)	M1 A1 (3)
	(*d*)	Equation of l: $y = \frac{2}{3}x$	B1
		Substitute into part (*c*): $\frac{2}{3}x-4 = -\frac{11}{6}x + \frac{88}{6}$	M1
		$\Rightarrow x = 7\frac{7}{15}, \ y = 4\frac{44}{45}$	A1, A1 (4)
			(13 marks)
8.	(*a*)	9	B1 (1)
	(*b*)	 Shape	B1
		Position of max.	B1
	(*c*)	5 on y-axis	B1
		-1 and 5 on x-axis	M1 A1 (5)
	(*d*)	Gradient: $\dfrac{8-(-7)}{3-(-2)}$	M1 A1
		$y-8 =$ "gradient" $(x-3)$ $\quad y = 3x-1$	M1 A1 (4)
	(*d*)	Where $y=0$, $\quad x = \dfrac{1}{3}$	M1 A1ft (2)
	(*e*)	Mid point: $\left(\dfrac{-7+8}{2}, \dfrac{-2+3}{2}\right) = \left(\dfrac{1}{2}, \dfrac{1}{2}\right)$ $\quad k = 1$	M1 A1 (2)
			(14 marks)