	Give 1 mark for each •	Illustration(s) for awarding each mark
1	**C**	**Award 2 marks for each correct answer** **10 marks**
2	**A**	
3	**B**	
4	**D**	
5	**A**	
6(a)	**ans: proof (3 marks)**	
	_1 knows to substitute	_1 $(3x - \frac{1}{x})^2 + 6$
	_2 squares bracket correctly	_2 $9x^2 - 6 + \frac{1}{x^2} + 6$
	_3 simplifies to required form	_3 $= 9x^2 + \frac{1}{x^2}$
7(a)	**ans: proof (4 marks)**	
	_1 finds midpoint of BC	_1 $(1, -4)$
	_2 finds gradient	_2 $m = \frac{8+4}{9-1} = \frac{12}{8} = \frac{3}{2}$
	_3 substitutes into $y - b = m(x - a)$	_3 $y - 8 = \frac{3}{2}(x - 9)$ or $y + 4 = \frac{3}{2}(x - 1)$
	_4 rearranges to required form	_4 $2y - 16 = 3x - 27;\ 2y - 3x + 11 = 0$
(b)	**ans: T(5, 2) (4 marks)**	
	_1 establishes equation of second line	_1 $y + 2x = 12$
	_2 knows to use simultaneous equations	_2 evidence
	_3 solves for x and y	_3 $x = 5;\ y = 2$
	_4 states coordinates of T	_4 T(5, 2)
8	**ans: $1 + 4x^{-5}$ (4 marks)**	
	_1 brings power up	_1 $x^{-2}(x^3 - x^{-2})$
	_2 prepares to differentiate	_2 $x - x^{-4}$
	_3 differentiates first term	_3 1……
	_4 differentiates second term	_4 ….. $+ 4x^{-5}$
		Note: mark 4 can only be awarded when differentiating a negative power.

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9(a)	**ans: 30** **(1 mark)**	
	_[1] finds limit	_[1] $L = \dfrac{12}{1-0\cdot 6} = \dfrac{12}{0\cdot 4} = 30$
(b)	**ans: $n = 3$** **(3 marks)**	
	_[1] knows to find subsequent terms _[2] continues sequence _[3] states smallest value of n	_[1] $U_1 = 0\cdot 6\times 200 + 12 = 132; 132 - 30 = 102$ _[2] $U_2 = 91\cdot 2(61\cdot 2);\ U_3 = 66\cdot 72(36\cdot 72)$ _[3] $n = 3$
10(a)	**ans: A(3, 54); B(4, 0)** **(6 marks)**	
	_[1] knows to differentiate _[2] equates derivative to 0 _[3] solves for x _[4] finds y coordinate _[5] makes equation equal to 0 _[6] solves to find B	_[1] $\dfrac{dy}{dx} = 24x^2 - 8x^3$ _[2] $24x^2 - 8x^3 = 0$ _[3] $8x^2(3-x) = 0;\ x = 3$ _[4] $y = 8(3)^3 - 2(3)^4 = 216 - 162 = 54$ A(3, 54) _[5] $8x^3 - 2x^4 = 0$ _[6] $2x^3(4-x) = 0;\ x = 4;$ B(4, 0)
(b)	**ans: 91^o** **(3 marks)**	
	_[1] finds gradient of AB _[2] knows to take $\tan^{-1}$ _[3] answer correctly rounded	_[1] $m_{AB} = \dfrac{54-0}{3-4} = -54$ _[2] $\tan^{-1}$=……. _[3] 91^o
11	**ans: $a = 4$** **(2 marks)**	
	_[1] substitutes for x and y _[2] solves for _[2]	_[1] $3 = \log_a 16 + 1$ $\log_a 16 = 2;\ a^2 = 16;\ a = 4$

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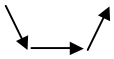
	ans: 2·67 **(5 marks)** _[1] prepares to differentiate _[2] differentiates _[3] equates derivative to 0 _[4] solves for r _[5] justifies answer	_[1] $A(r) = 120r^{-1} + \pi r^2$ _[2] $A'(r) = -120r^{-2} + 2\pi r$ _[3] $-120r^{-2} + 2\pi r = 0$ _[4] $r = 2_67$ _[5]  or other acceptable method Total: 45 marks