

Q	Marking instructions	AO	Marks	Typical solution
15(a)	Obtains $\pm \frac{1}{2x} = \frac{y-2.5}{x-3}$ or $\pm 2x = \frac{y-2.5}{x-3}$ OE eg in the form of the equation of the straight line. Or Uses distance formula (may be in terms of x and y) $(d^2 =)(x-3)^2 + (y-2.5)^2$	3.1a	M1	$\frac{dy}{dx} = 2x$ $-\frac{1}{2x} = \frac{y-2.5}{x-3}$ $-\frac{1}{2x} = \frac{x^2-2.5}{x-3}$ $-(x-3) = 2x^3-5x$ $2x^3-4x-3=0$
	Obtains $-\frac{1}{2x} = \frac{y-2.5}{x-3}$ OE May have y replaced with x^2 Or Obtains $(x-3)^2 + (x^2-2.5)^2$	3.1a	A1	
	Obtains $\pm \frac{1}{2x} = \frac{x^2-2.5}{x-3}$ OE Or $\pm 2x = \frac{x^2-2.5}{x-3}$ OE Or Differentiates their distance or distance ² expression $\frac{d(d^2)}{dx} = 2x-6+2(x^2-2.5) \times 2x$ $= 4x^3-8x-6$	3.1a	M1	
	Completes reasoned argument to show $2x^3-4x-3=0$ Must see at least one line of correct intermediate working.	2.1	R1	
Subtotal			4	

Q	Marking instructions	AO	Marks	Typical solution
15(b)	Obtains $6x^2 - 4$ May be explicit or seen as denominator in their $\frac{2x_n^3 - 4x_n - 3}{6x_n^2 - 4}$	1.1b	B1	$f(x) = 2x^3 - 4x - 3 = 0$ $f'(x) = 6x^2 - 4$ $x_{n+1} = x_n - \frac{2x_n^3 - 4x_n - 3}{6x_n^2 - 4}$ $= \frac{x_n(6x_n^2 - 4) - 2x_n^3 - 4x_n - 3}{6x_n^2 - 4}$ $= \frac{6x_n^3 - 4x_n - 2x_n^3 + 4x_n - 3}{6x_n^2 - 4}$ $= \frac{4x_n^3 + 3}{6x_n^2 - 4}$
	Forms $x_n - \frac{2x_n^3 - 4x_n - 3}{6x_n^2 - 4}$ Their " $6x_n^2 - 4$ " Condone missing or inconsistent subscripts FT their $f'(x) = ax^2 - 4$ if stated explicitly	1.1a	M1	
	Obtains two correct fractions eg $\frac{x_n(6x_n^2 - 4)}{6x_n^2 - 4} \quad \frac{2x_n^3 - 4x_n - 3}{6x_n^2 - 4}$ Or obtains a single correct fraction with five terms in the numerator Condone missing or inconsistent subscripts	3.1a	A1	
	Completes reasoned argument with a single correct fraction before obtaining $x_{n+1} = \frac{4x_n^3 + 3}{6x_n^2 - 4}$ Condone missing or inconsistent subscripts but $x_{n+1} = \frac{4x_n^3 + 3}{6x_n^2 - 4}$ must be stated. AG	2.1	R1	
	Subtotal		4	

Q	Marking instructions	AO	Marks	Typical solution
15(c)	Obtains 2.22 or AWRT 1.829 or AWRT 1.709 For 2.22 accept 2.220 or correct fraction $\frac{111}{50}$	1.1a	M1	$x_1 = 2.22$ $x_2 = 1.828840\dots$ $x_3 = 1.709$
	Obtains AWRT 1.709 as their final answer.	1.1b	A1	
	Subtotal		2	

Q	Marking instructions	AO	Marks	Typical solution
15(d)	Uses expression for distance with their x_3 or a better approximation.	3.1a	M1	$\sqrt{(1.709 - 3)^2 + (1.709^2 - 2.5)^2}$ $= 1.3578\dots$ $= 1.36$
	Deduces AWRT 1.36	1.1b	A1	
	Subtotal		2	

	Question 15 Total		12	
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