

Question	Scheme	Marks	AOs
16 (a) (i)	Uses $\frac{dy}{dx} = -3$ at $x = 2 \Rightarrow 12a + 60 - 39 = -3$	M1	1.1b
	Solves a correct equation and shows one correct intermediate step $12a + 60 - 39 = -3 \Rightarrow 12a = -24 \Rightarrow a = -2$ *	A1*	2.1
(a) (ii)	Uses the fact that $(2,10)$ lies on C $10 = 8a + 60 - 78 + b$	M1	3.1a
	Subs $a = -2$ into $10 = 8a + 60 - 78 + b \Rightarrow b = 44$	A1	1.1b
		(4)	
(b)	$f(x) = -2x^3 + 15x^2 - 39x + 44 \Rightarrow f'(x) = -6x^2 + 30x - 39$	B1	1.1b
	Attempts to show that $-6x^2 + 30x - 39$ has no roots Eg. calculates $b^2 - 4ac = 30^2 - 4 \times -6 \times -39 = -36$	M1	3.1a
	States that as $f'(x) \neq 0 \Rightarrow$ hence $f(x)$ has no turning points *	A1*	2.4
		(3)	
(c)	$-2x^3 + 15x^2 - 39x + 44 \equiv (x - 4)(-2x^2 + 7x - 11)$	M1	1.1b
		A1	1.1b
		(2)	
(d)	Deduces either intercept. $(0, 44)$ or $(20, 0)$	B1 ft	1.1b
	Deduces both intercepts $(0, 44)$ and $(20, 0)$	B1 ft	2.2a
		(2)	

(11 marks)

Notes

(a)(i)

M1: Attempts to use $\frac{dy}{dx} = -3$ at $x = 2$ to form an equation in a . Condone slips but expect to see two of the powers reduced correctly

A1*: Correct differentiation with one correct intermediate step before $a = -2$

(a)(ii)

M1: Attempts to use the fact that $(2,10)$ lies on C by setting up an equation in a and b with $a = -2$ leading to $b = \dots$

A1: $b = 44$

(b)

B1: $f'(x) = -6x^2 + 30x - 39$ oe

M1: Correct attempt to show that " $-6x^2 + 30x - 39$ " has no roots.

This could involve an attempt at

- finding the numerical value of $b^2 - 4ac$
- finding the roots of $-6x^2 + 30x - 39$ using the quadratic formula (or their calculator)
- completing the square for $-6x^2 + 30x - 39$

A1*: A fully correct method with reason and conclusion. Eg as $b^2 - 4ac = -36 < 0, f'(x) \neq 0$ meaning that no stationary points exist

(c)

M1: For an attempt at division (seen or implied) Eg $-2x^3 + 15x^2 - 39x + b \equiv (x - 4) \left(-2x^2 \dots \pm \frac{b}{4} \right)$

A1: $(x - 4)(-2x^2 + 7x - 11)$ Sight of the quadratic with no incorrect working seen can score both marks.

(d)

See scheme. You can follow through on their value for b