

Question	Scheme	Marks	AOs
4(a)	States or uses $f(+3) = 0$	M1	1.1b
	$4(3)^3 - 12(3)^2 + 2(3) - 6 = 108 - 108 + 6 - 6 = 0$ and so $(x - 3)$ is a factor	A1	1.1b
		(2)	
(b)	Begins division or factorisation so x $4x^3 - 12x^2 + 2x - 6 = (x - 3)(4x^2 + \dots)$	M1	2.1
	$4x^3 - 12x^2 + 2x - 6 = (x - 3)(4x^2 + 2)$	A1	1.1b
	Considers the roots of their quadratic function using completion of square or discriminant	M1	2.1
	$(4x^2 + 2) = 0$ has no real roots with a reason (e.g. negative number does not have a real square root, or $4x^2 + 2 > 0$ for all x So $x = 3$ is the only real root of $f(x) = 0$ *	A1*	2.4
		(4)	

(6 marks)

Notes:

(a)

M1: States or uses $f(+3) = 0$

A1: See correct work evaluating and achieving zero, together with correct conclusion

(b)

M1: Needs to have $(x - 3)$ and first term of quadratic correct

A1: Must be correct – may further factorise to $2(x - 3)(2x^2 + 1)$

M1: Considers their quadratic for no real roots by use of completion of the square or consideration of discriminant then

A1*: A correct explanation