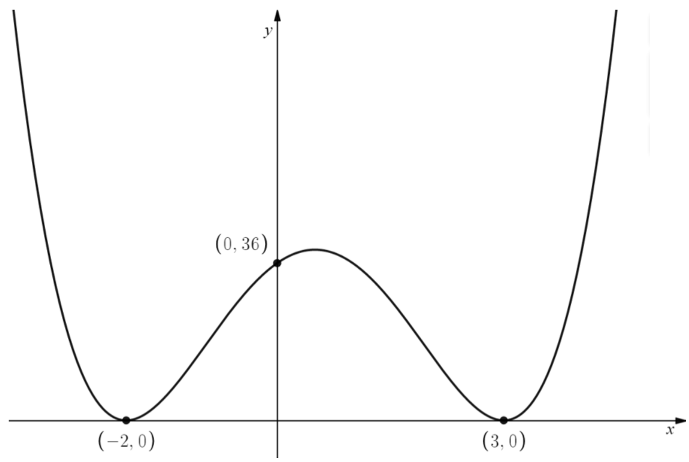
Question	Scheme	Marks	AOs
4(a)	$f(x) = x^4 - 2x^3 - 11x^2 + 12x + 36$		
	$f(3) = (3)^4 - 2(3)^3 - 11(3)^2 + 12(3) + 36$ $= 81 - 54 - 99 + 36 + 36 = \dots$	M1	1.1b
	$f(3) = 0$ hence $(x-3)$ is a factor of $f(x)$ (by the factor theorem). *	A1*	2.4
		(2)	
(b)	Deduces $a = 2$	B1	2.2a
		(1)	
(c)	 Shape (positive quartic with two minima).	B1	1.1b
	$(-2, 0)$ and $(3, 0)$	B1ft	1.1b
	$(0, 36)$	B1	1.1b
	Maximum in 1st quadrant.	B1	2.2a
		(4)	
			(7 marks)

Notes:

(a)

M1: Attempts to calculate $f(3)$. Attempted division of $f(x)$ by $(x-3)$ is M0.

Either line in the main scheme is acceptable.

A1*: Correct calculation, reason and conclusion. It must follow M1. Accept, for example,

$f(3) = 0$ hence $(x-3)$ is a factor of $f(x)$ (by the factor theorem).

$f(3) = 0$ hence $(x-3)$ is a factor.

(b)

B1: Deduces that $a = 2$

(c)

B1: Shape (positive quartic with two minima).

B1ft: $(-2, 0)$ and $(3, 0)$ labelled in the correct place at the minima. Condone -2 and 3.

Follow through on their a.

B1: $(0, 36)$ labelled as the y intercept. Condone 36.

B1: Local maximum in the first quadrant is the only other turning point.