Question	Scheme	Marks	AOs
11 (a)	$f'(x) = k - 4x - 3x^2$		
	$f''(x) = -4 - 6x = 0$	M1	1.1b
	Criteria 1 **Either** $f''(x) = -4 - 6x = 0 \Rightarrow x = \dfrac{4}{-6} \Rightarrow x = -\dfrac{2}{3}$ **or** $f''\left(-\dfrac{2}{3}\right) = -4 - 6\left(-\dfrac{2}{3}\right) = 0$ **Criteria 2** **Either** • $f''(-0.7) = -4 - 6(-0.7) = 0.2 > 0$ $f''(-0.6) = -4 - 6(-0.6) = -0.4 < 0$ **or** • $f'''\left(-\dfrac{2}{3}\right) = -6 \neq 0$		
	At least one of Criteria 1 or Criteria 2	B1	2.4
	Both Criteria 1 and Criteria 2 **and** concludes C has a point of inflection at $x = -\dfrac{2}{3}$	A1	2.1
		(3)	
(b)	$f'(x) = k - 4x - 3x^2,\ AB = 4\sqrt{2}$		
	$f(x) = kx - 2x^2 - x^3 \ \{+c\}$	M1	1.1b
		A1	1.1b
	$f(0) = 0$ or $(0, 0) \Rightarrow c = 0 \Rightarrow f(x) = kx - 2x^2 - x^3$ $\{f(x) = 0 \Rightarrow\}\ f(x) = x(k - 2x - x^2) = 0 \Rightarrow \{x = 0,\}\ k - 2x - x^2 = 0$	A1	2.2a
	$\{x^2 + 2x - k = 0\} \Rightarrow (x+1)^2 - 1 - k = 0,\ x = \ldots$	M1	2.1
	$\Rightarrow x = -1 \pm \sqrt{k+1}$	A1	1.1b
	$AB = \left(-1 + \sqrt{k+1}\right) - \left(-1 - \sqrt{k+1}\right) = 4\sqrt{2} \Rightarrow k = \ldots$	M1	2.1
	So, $2\sqrt{k+1} = 4\sqrt{2} \Rightarrow k = 7$	A1	1.1b
		(7)	
			(10 marks)

Question 11 Notes:	
(a)	
M1:	E.g. • attempts to find $f''\left(-\frac{2}{3}\right)$ • finds $f''(x)$ and sets the result equal to 0
B1:	See scheme
A1:	See scheme
(b)	
M1:	Integrates $f'(x)$ to give $f(x) = \pm kx \pm \alpha x^2 \pm \beta x^3,\ \alpha, \beta \neq 0$ with or without the constant of integration
A1:	$f(x) = kx - 2x^2 - x^3$, with or without the constant of integration
A1:	Finds $f(x) = kx - 2x^2 - x^3 + c$, and makes some reference to $y = f(x)$ passing through the origin to deduce $c = 0$. Proceeds to produce the result $k - 2x - x^2 = 0$ or $x^2 + 2x - k = 0$
M1:	Uses a valid method to solve the quadratic equation to give *x* in terms of *k*
A1	Correct roots for *x* in terms of *k*. i.e. $x = -1 \pm \sqrt{k+1}$
M1:	Applies $AB = 4\sqrt{2}$ on $x = -1 \pm \sqrt{k+1}$ in a complete method to find $k = ...$
A1:	Finds $k = 7$ from correct solution only