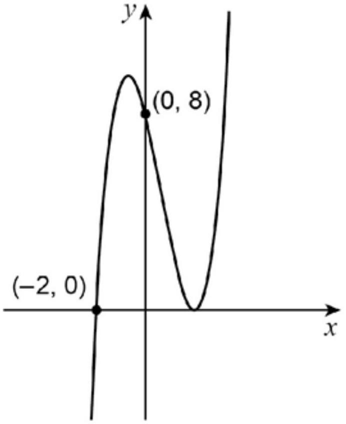
Q	Marking instructions	AO	Marks	Typical solution
11(a)	Substitutes $x=-2$ into $\mathrm{p}(x)$ Condone missing brackets	1.1a	M1	$\mathrm{p}(-2)=(-2)^3+(b+2)(-2)^2+2(b+2)(-2)+8$ $=-8+4b+8-4b-8+8$ $=0$ Hence $(x+2)$ is a factor of $\mathrm{p}(x)$ for all values of b
	Demonstrates clearly that $\mathrm{p}(-2)=0$ Must see numerical evaluation of powers of -2 and either $-8+4b+8-4b-8+8=0$ or $-8+4(b+2)-4(b+2)+8=0$ or $-8+(b+2)(4-4)+8=0$	2.1	A1	
	Concludes and states that $(x+2)$ is a factor for **all/any values of *b***	2.4	R1	
	Subtotal		**3**	

Q	Marking instructions	AO	Marks	Typical solution
11(b)(i)	Sketches cubic graph with correct orientation and two turning points	1.2	B1	
	Sketches any cubic that would only ever meet the x-axis at exactly two points	2.2a	M1	
	Sketches a correctly orientated cubic graph that has a • single root labelled x = -2 • y intercept labelled at 8 • repeated root on the positive x-axis Ignore any value shown at the other root	1.1b	A1	
	Subtotal		**3**	

Q	Marking instructions	AO	Marks	Typical solution
11(b)(ii)	Deduces a pair of possible factors of (x^2+bx+4) Either $(x+2)^2$ or $(x-2)^2$ or $(x+1)(x+4)$ or $(x-1)(x-4)$ or Uses b^2-4ac OE PI $b=4$ or $b=-4$ or b^2-16 seen	2.2a	M1	$b^2-4ac=0$ $b^2-16=0$ $\Rightarrow b=\pm 4$ $b=4$ gives only one point of intersection $\therefore b=-4$
	Identifies the quadratic factor as $(x-2)^2$ or Obtains $b^2-16=0$ OE PI by $b=\pm 4$ or $b=-4$	2.1	R1	
	Obtains either $b=\pm 4$ or $b=-4$	1.1a	M1	
	Rejects $b=4$ giving a reason and concludes $b=-4$ Valid reasons would be: • only one factor or root • only one point of intersection with x-axis • it would be $(x+2)^3$ which only has one point of intersection	2.4	R1	
	Subtotal		**4**	

	Question 11 Total		**10**	