

Q	Marking Instructions	AO	Marks	Typical Solution
12(a)	Begins a proof using a valid method Eg. Factor theorem, algebraic division, multiplication of correct factors	AO1.1a	M1	$p\left(-\frac{1}{2}\right) = 30 \times \left(-\frac{1}{2}\right)^3 - 7 \left(-\frac{1}{2}\right)^2 - 7 \left(-\frac{1}{2}\right) + 2$ $= 0$ $\therefore 2x + 1 \text{ is a factor of } p(x)$
	Constructs rigorous mathematical proof. To achieve this mark: Factor theorem the student must clearly substitute and state that $p(-1/2)=0$ and clearly state that this implies that $2x + 1$ is a factor Algebraic division OR Multiplication of correct factors The method must be completely correct with a concluding statement	AO2.1	R1	
(b)	Obtains quadratic factor PI	AO1.1a	M1	$p(x) = (2x + 1)(15x^2 - 11x + 2)$ $= (2x + 1)(5x - 2)(3x - 1)$
	Obtains second linear factor	AO1.1b	A1	
	Writes $p(x)$ as the product of the correct three linear factors. NMS correct answer 3/3	AO1.1b	A1	
(c)	Rearranges to achieve a cubic equation in $\sec x$ (or $\cos x$ )	AO3.1a	M1	$\frac{30\sec^2 x + 2\cos x}{7} = \sec x + 1$ $\Rightarrow 30\sec^2 x + 2\cos x = 7\sec x + 7$ $\Rightarrow 30\sec^3 x + 2 = 7\sec^2 x + 7\sec x$ $30\sec^3 x - 7\sec^2 x - 7\sec x + 2 = 0$ $\Rightarrow (2\sec x + 1)(5\sec x - 2)(3\sec x - 1) = 0$ $\Rightarrow \sec x = -\frac{1}{2}, \frac{1}{3}, \frac{2}{5}$ <p>These values do not fall within the range of <math>\sec x</math> as they are between -1 and 1</p> $\therefore \frac{30\sec^2 x + 2\cos x}{7} = \sec x + 1 \text{ has no real solutions.}$
	Equates to zero and uses result from (b) or factorises	AO1.1a	M1	
	Deduces that if solutions exist they must be of the form $\sec x = -\frac{1}{2}$ , $\sec x = 1/3$ or $\sec x = 2/5$ OE	AO2.2a	A1	
	Explains that the range of $\sec x$ is $(-\infty, -1] \cup [1, \infty)$ OE OE for $\cos x$	AO2.4	E1	
	Completes argument explaining that there cannot be any real solutions as values are outside of the function's range.	AO2.1	R1	
<b>Total</b>			<b>10</b>	