Question Number	Scheme	Marks
4(a)	Any correct constant, so for $A=2$ or $B=3$ or $C=-1$ or $D=5$	B1
	$2x^4+15x^3+35x^2+21x-4=Ax^2(x+3)^2+Bx(x+3)^2+C(x+3)^2+D$ $\Rightarrow A=...,B=...,C=...,D=...$ or $2x^4+15x^3+35x^2+21x-4\div(x^2+6x+9)=...x^2+...x+...+\frac{...}{(x+3)^2}$	M1
	2 correct of $A=2,B=3,C=-1,D=5$	A1
	$A=2,B=3,C=-1,D=5$	A1
		(4)
(b)	$\int f(x)\,dx=\int\left(2x^2+3x-1+\frac{5}{(x+3)^2}\right)dx=\frac{2x^3}{3}+\frac{3x^2}{2}-x-\frac{5}{x+3}(+c)$	M1A1ftA1
		(3)
		Total 7

(a)

B1: One correct constant or one correct term in $Ax^2+Bx+C+\frac{D}{(x+3)^2}$

M1: Complete method for finding *A, B, C* and *D*
For example substitution/comparing coefficients/long division
Via substitution/comparing coefficients the minimum required is an identity of the correct form (condoning slips) followed by values for *A, B, C* and *D.*
See scheme but there are other versions including
$2x^4+15x^3+35x^2+21x-4=(Ax^2+Bx+C)(x+3)^2+D\Rightarrow A=...,B=...,C=...,D=...$

Via division look for a divisor of x^2+6x+9, a quotient that is a quadratic and a remainder that is either linear or a constant term.
It could be attempted by dividing by $(x+3)$ twice.

FYI, the first division gives $2x^3+9x^2+8x-3$ with a remainder of 5
A1: 2 correct constants following the award of M1
For division, when the remainder is a linear term, it would be scored for two correct of Ax^2+Bx+C
A1: All correct following the award of M1

(b)

M1: $\int\frac{D}{(x+3)^2}dx\to\frac{k}{x+3}$ where *k* is a constant.

This may be awarded following a term of $\int\frac{\alpha x+D}{(x+3)^2}dx$ following division**.**

Look for $\int\frac{\alpha x+D}{(x+3)^2}dx$ being correctly split and $\to\int\frac{\alpha x}{(x+3)^2}dx+\int\frac{D}{(x+3)^2}dx\to$ something $+\frac{k}{x+3}$

A1ft: $\int\left(Ax^2+Bx+C+\frac{D}{(x+3)^2}\right)\mathrm{d}x=\frac{Ax^3}{3}+\frac{Bx^2}{2}+Cx-\frac{D}{x+3}(+c)\cdot$

Correct integration following through on their non-zero constants.

Allow this to be scored with *A*, *B*, *C* and *D* as above or with made up values

A1: All correct with or without "+ *c*". Allow $-1x$ for $-x$

Question Number	Scheme	Marks
5(a) Way One	$\cot^2 x - \tan^2 x \equiv \dfrac{\cos^2 x}{\sin^2 x} - \dfrac{\sin^2 x}{\cos^2 x} \equiv \dfrac{\cos^4 x - \sin^4 x}{\sin^2 x \cos^2 x}$	M1
	$\equiv \dfrac{\left(\cos^2 x - \sin^2 x\right)\left(\cos^2 x + \sin^2 x\right)}{\sin^2 x \cos^2 x} \equiv \dfrac{\cos 2x}{\ldots}$ or $\dfrac{\ldots}{\left(\frac{1}{2}\sin 2x\right)^2}$	dM1
	$\equiv \dfrac{\cos 2x}{\left(\frac{1}{2}\sin 2x\right)^2}$	A1
	$\equiv 4\dfrac{\cos 2x}{\sin 2x \sin 2x} \equiv 4\cot 2x \operatorname{cosec} 2x$ *	A1*
		(4)
(b)	$4\cot 2\theta \operatorname{cosec} 2\theta = 2\tan^2\theta \Rightarrow \cot^2\theta - \tan^2\theta = 2\tan^2\theta \Rightarrow \cot^2\theta - 3\tan^2\theta = 0$	M1
	$\cot^2\theta - 3\tan^2\theta = 0 \Rightarrow \dfrac{1}{\tan^2\theta} - 3\tan^2\theta = 0 \Rightarrow \tan^4\theta = \dfrac{1}{3}$	A1
	$\tan^4\theta = "\frac{1}{3}" \Rightarrow \tan\theta = \pm\sqrt[4]{"\frac{1}{3}"} = "\pm 0.7598.." \Rightarrow \theta = \ldots$	M1
	$\theta =$ awrt $0.65,\ -0.65$	A1A1
		(5)
		Total 9

(a) Way One LHS to RHS

M1: Changes the LHS to sin *x* and cos *x* and attempts to make a single fraction using a correct common denominator. Condone errors/slips on the numerator

dM1: Attempts/ applies

- Either $\cos^4 x - \sin^4 x = \left(\cos^2 x - \sin^2 x\right)\left(\cos^2 x + \sin^2 x\right) = \cos^2 x - \sin^2 x = \cos 2x$ on the numerator
- Or $\sin 2x = 2\sin x \cos x$ to the denominator condoning bracketing slip

A1: Applies both of the above correctly to achieve a correct expression in terms of cos2*x* and sin2*x*

A1*: Reaches the right hand side with sufficient working shown. Expect to see $\sin^2 2x$ split into $\sin 2x \sin 2x$
Penalise consistent (not once or twice) use of poor notation on this mark only.

Examples $\cos^2 x \leftrightarrow \cos x^2$, $\sin^2 \leftrightarrow \sin^2 x$, constantly switching between $x \leftrightarrow \theta$

(b) Allow use of $x \leftrightarrow \theta$

M1: Uses part (a) and attempt to collects terms. (See Appendix III for ways not using part (a))
See below for equations in $\sin\theta$ or $\cos\theta$ where this mark is awarded for an equation in just $\sin\theta$ or $\cos\theta$

A1: Reaches a correct equation in a single term, usually $\tan\theta$. Look for $\tan^4\theta = \dfrac{1}{3}$ o.e. such as $3\tan^4\theta = 1$

Other correct intermediate forms are $2\sin^4\theta + 2\sin^2\theta - 1 = 0$ and $2\cos^4\theta - 6\cos^2\theta + 3 = 0$

M1: Takes the 4th root of their $\dfrac{1}{3}$ (o.e) and uses tan-1 (you may need to check) to obtain at least one value for θ

For the other intermediate forms look for working such as $\sin^2\theta = \dfrac{\sqrt{3}-1}{2} \Rightarrow \sin\theta = \sqrt{\dfrac{\sqrt{3}-1}{2}} \Rightarrow \theta = \ldots$