Question Number	Scheme	Marks
2. (a)	For correct term ${}^6C_4 3^2 (ax)^4$	M1
	Sets $15\times 3^2 a^4 = 540$	A1
	$a^4 = 4 \Rightarrow a = \pm\sqrt{2}$	dM1 A1 **(4)**
(b)	$\frac{1}{81}\times 3^6 + a^6$	M1 A1
	$=17$	A1 **(3)** **(7 marks)**

(a)

M1 For an attempt at the correct term of the binomial expansion which may be embedded within a full expansion.

Accept ${}^6C_4 3^2 (ax)^4, \frac{6!}{4!2!}3^2 (ax)^4, \binom{6}{4}3^2(ax)^4, 135(ax)^4$ etc but must have correct coefficient and correct powers of 3 and x. Allow equivalents such as ${}^6C_2 3^2 (ax)^4$ and condone a missing bracket for this mark ie. $135ax^4$.

You may condone a slip on the 3 if the rest of an expansion is correct.

A1 For a correct equation in a. Allow $15\times 3^2 a^4 = 540$ or $15\times 3^2 (ax)^4 = 540x^4$ The coefficient must be evaluated for this mark

dM1 For $"135"a^4 = 540 \Rightarrow a = \ldots$ Condone slips on the 540 or errors simplifying an initially correct coefficient, but must be attempting a fourth root. This is implied by a =1.41

A1 $a = \pm\sqrt{2}$ must be exact. Accept $\pm\sqrt[4]{4}$ oe

(b)

M1 For identifying two terms independent of x. Allow if the power of 3 is incorrect but it is clear the correct terms are meant, so $\frac{1}{81}\times$constant term from $(3+ax)^6$ and $a^6x^6 \times \frac{1}{x^6} = a^6$ extracted.

A1 Both terms correct and added, ie. $\frac{1}{81}\times 3^6 + a^6$ with a or following through on their value of a but allow if terms are initially correct individually but slips when evaluating.

A1 17 Allow recovery to 17 from use of decimals but 17.0 is A0.

Question Number	Scheme	Marks
3. (a)	Attempts $f\left(-\frac{3}{2}\right)=6\left(-\frac{3}{2}\right)^3+17\left(-\frac{3}{2}\right)^2+4\left(-\frac{3}{2}\right)-12$	M1
	$=0\Rightarrow(2x+3)$ is a factor *	A1*
		(2)
(b)	$6x^3+17x^2+4x-12=(2x+3)\left(3x^2+4x-4\right)$	M1 A1
	$=(2x+3)(3x-2)(x+2)$	dM1 A1
		(4)
(c)	Solves $\tan\theta=-\frac{3}{2}$ or "–2" or "$\frac{2}{3}$ "	M1
	$\theta=$ awrt 2.03, 2.16	A1
		(2)
		(8 marks)

(a)

M1 Allow for an attempt at finding a value of $f\left(-\frac{3}{2}\right)=6\left(-\frac{3}{2}\right)^3+17\left(-\frac{3}{2}\right)^2+4\left(-\frac{3}{2}\right)-12$

Sight of embedded values is sufficient. Attempted division is M0

A1* Correctly shows $f\left(-\frac{3}{2}\right)=0$ and states "hence factor" (or substantial equivalent conclusion).

They may state "factor if $f\left(-\frac{3}{2}\right)=0$" in a preamble, in which case accept a minimal conclusion such as //

The M must be scored so there needs to be evidence of either embedded $\left(-\frac{3}{2}\right)$'s or calculations.

(b) Allow for work done in part (a) if referred to in part (b).

M1 Attempt to divide or factorise out $(2x+3)$

By factorisation look for $6x^3+17x^2+4x-12=(2x+3)\left(3x^2+kx\pm4\right)$

By division look for $2x+3\overline{)6x^3+17x^2+4x-12}$ with $3x^2\ \pm4x.....$ and $6x^3+9x^2$

By comparing coefficients look for $6x^3+17x^2+4x-12=(2x+3)(ax^2+bx+c)\Rightarrow a=3,c=\pm4,b=...$

A1 Correct quadratic factor $\left(3x^2+4x-4\right)$ found. May be within the long division.

dM1 Attempts to factorise their $\left(3x^2+4x-4\right)$ usual rules.

A1 $(2x+3)(3x-2)(x+2)$ written out as a product of factors (not as a list) and isw.

Allow $3(2x+3)\left(x-\frac{2}{3}\right)(x+2)$ oe as long as there are three linear factors.

Factors given but no working shown scores M0A0dM0A0