Question	Answer	Marks	Partial Marks
2(b)	*their* $\left(16-96x+216x^2\ldots..\right)\times\left(1+\frac{a}{x}\right)$ $= 16-96x+16\frac{a}{x}-96a+216ax\ldots$ soi	**B1**	**FT** Expansion using *their* **(a)**
	$a=2$	**B1**	**FT** *their* $16\frac{a}{x}$
	$b=-176$	**B1**	
	$c=336$	**B1**	
3(a)	$\frac{\cos x}{1-\cos x}+\frac{\cos x}{1+\cos x}$ or $\frac{\sec x+1+\sec x-1}{\sec^2 x-1}$	**M1**	
	$\frac{\cos x+\cos^2 x+\cos x-\cos^2 x}{1-\cos^2 x}$ or $\frac{2\sec x}{\tan^2 x}$	**A1**	
	$\frac{2\cos x}{\sin^2 x}$ or $\frac{2\cos^2 x}{\cos x\sin^2 x}$ oe	**A1**	
	Fully correct justification of given answer: 2cot*x*cosec*x*	**A1**	
3(b)	$3\tan^2 x=2$ oe or better, soi or $5\cos^2 x=3$ oe or better, soi or $5\sin^2 x=2$ oe or better, soi	**B1**	
	$\tan x=[\pm]\sqrt{\frac{2}{3}}$ oe or [±] 0.816[4…] or $\cos x=[\pm]\sqrt{\frac{3}{5}}$ oe or [±] 0.774[5…] or $\sin x=[\pm]\sqrt{\frac{2}{5}}$ oe or [±] 0.632[4…]	**M1**	**FT** an equation of the form $a\tan^2 x=b$, $a>0$, $b>0$ or $p\sin^2 x=q$ or $p\cos^2 x=q$ where $p>0$, $q>0$ and $p>q$
	39.2° or 39.2315… rot to 2 or more dp 140.8° or 140.7684… rot to 2 or more dp 219.2° or 219.2315… rot to 2 or more dp 320.8° or 320.7684… rot to 2 or more dp	**A2**	no extras in range **A1** for any two correct answers

Question	Answer	Marks	Partial Marks
4(a)	$\frac{dy}{dx} = \frac{3}{x} + 2x - 7$	**B2**	**B1** for the first term correct and one other term correct or for all terms correct with extra terms seen
	Equates *their* $\frac{dy}{dx}$ to zero and rearranges to 3-term quadratic in x	**M1**	
	Solves *their* 3-term quadratic	**M1**	**Dep** on previous M1
	$x = 0.5,\ 3$ nfww isw	**A1**	no extra solutions
4(b)	$\frac{d^2y}{dx^2} = -\frac{3}{x^2} + 2$	**M1**	**FT** *their* $\frac{dy}{dx}$ providing B1 earned in **(a)**
	$x = 0.5$, $\frac{d^2y}{dx^2} < 0 \rightarrow \max$ or $\frac{d^2y}{dx^2} = -10 \rightarrow \max$	**A1**	
	$x = 3$, $\frac{d^2y}{dx^2} > 0 \rightarrow \min$ or $\frac{d^2y}{dx^2} = \frac{5}{3} \rightarrow \min$	**A1**	
	Alternative method		
	Considers gradient at $x - h$ and $x + h$ for $x = 0.5$ or $x = 3$ [where h is small] or Considers y-values at $x - h$ and $x + h$ for $x = 0.5$ or $x = 3$ [where h is small]	**(M1)**	**FT** *their* $\frac{dy}{dx}$ providing B1 earned in **(a)**
	Correct conclusion for one turning point max at $x = 0.5$ or min at $x = 3$	**(A1)**	
	Correct method and conclusion for second turning point	**(A1)**	