

2(a)	$R = 25$	B1
	$\tan \alpha = \frac{24}{7} \Rightarrow \alpha = \dots$	M1
	$\alpha = 1.287$	A1
		(3)
(b)(i)	$\text{Min} = \frac{5}{90 - 3 \times 25 \times (-1)}$	M1
	$= \frac{1}{33}$	A1
(b)(ii)	$(2x + 1.287) = \pi, \dots \Rightarrow x = \dots$	M1
	$\Rightarrow x = \frac{\pi - 1.287}{2} = 0.927$	A1
		(4)
		Total 7

8(a)	$\tan 3x \equiv \tan(2x + x) \equiv \frac{\tan 2x + \tan x}{1 - \tan 2x \tan x}$ or e.g. $\tan 3x \equiv \frac{\sin 3x}{\cos 3x} \equiv \frac{\sin(2x + x)}{\cos(2x + x)} \equiv \frac{\sin 2x \cos x + \cos 2x \sin x}{\cos 2x \cos x - \sin 2x \sin x} \equiv \frac{\tan 2x + \tan x}{1 - \tan 2x \tan x}$	M1
	$\frac{\tan 2x + \tan x}{1 - \tan 2x \tan x} \equiv \frac{\frac{2 \tan x}{1 - \tan^2 x} + \tan x}{1 - \frac{2 \tan x}{1 - \tan^2 x} \tan x}$	dM1
	$\frac{\frac{2 \tan x}{1 - \tan^2 x} + \tan x}{1 - \frac{2 \tan x}{1 - \tan^2 x} \tan x} \equiv \frac{2 \tan x + \tan x - \tan^3 x}{1 - \tan^2 x - 2 \tan^2 x}$ $\frac{3 \tan x - \tan^3 x}{1 - 3 \tan^2 x} *$	A1*
		(3)

(b)	$\frac{3 \tan \theta - \tan^3 \theta}{1 - 3 \tan^2 \theta} = 2 \sec^2 3\theta - 8 \Rightarrow \tan 3\theta = 2 \sec^2 3\theta - 8$ $\Rightarrow \tan 3\theta = 2(1 + \tan^2 3\theta) - 8$	M1
	$\Rightarrow 2 \tan^2 3\theta - \tan 3\theta - 6 = 0 \quad \text{or e.g.} \Rightarrow 2 \tan^2 3\theta - \tan 3\theta = 6$	A1
	$(2 \tan 3\theta + 3)(\tan 3\theta - 2) = 0 \Rightarrow \tan 3\theta = -\frac{3}{2}, 2$ $\tan 3\theta = -\frac{3}{2} \Rightarrow 3\theta = \dots \Rightarrow \theta = \dots \quad \text{or} \quad \tan 3\theta = 2 \Rightarrow 3\theta = \dots \Rightarrow \theta = \dots$	dM1
	$\theta = 0.37, 0.72, 1.42$	A1A1
		(5)
		Total 8

Question Number	Scheme	Marks
9(a)	$4 \sin \theta \cos \theta = 2 \sin 2\theta$	B1
	e.g. $\Rightarrow 6 \sin^2 \theta \cot 2\theta + 2 \sin 2\theta = (3 - 3 \cos 2\theta) \frac{\cos 2\theta}{\sin 2\theta} + 2 \sin 2\theta$	M1A1 (3)
(b)	$3 \cot 2\theta - 14 = 6 \sin^2 \theta \cot 2\theta + 4 \sin \theta \cos \theta$	
	e.g. $\Rightarrow 3 \cot 2\theta \sin 2\theta - 14 \sin 2\theta = (3 - 3 \cos 2\theta) \cos 2\theta + 2 \sin^2 2\theta$ $\Rightarrow -14 \sin 2\theta = -3(1 - \sin^2 2\theta) + 2 \sin^2 2\theta$ $5 \sin^2 2\theta + 14 \sin 2\theta - 3 = 0 \quad *$	M1 M1 A1* (3)
(c)	$(\sin 2x =) \frac{1}{5} \Rightarrow x = \dots$	M1
	$x = \text{awrt } 5.8^\circ, \text{ awrt } 84.2^\circ$	A1A1 (3)
		(9 marks)