

Trig Functions and Identities 1 Answers

1)

11 (i) $\tan x = -\frac{5}{3}$ $x = 121.0^\circ, 301.0^\circ$	M1 A1, $\sqrt{A1}$ [3]	M1 for use of tan and attempt at one solution A1 for each, $\sqrt{ }$ on first solution for x
(ii) $3 \sec^2 y - \sec y - 4 = 0$ $(3 \sec y - 4)(\sec y + 1) = 0$ $\cos y = \frac{3}{4}, -1$ $y = 41.4^\circ, 318.6^\circ, 180^\circ$	M1 M1 M1 B1, A1 [5]	M1 for use of correct identity and formation of a 3 term quadratic in one variable. M1 for factorising a 3 term quadratic M1 for all terms in terms of cos B1 for 180° , A1 for the other pair
(iii) $2z - 0.6 = 0.9273, 2.2143$ $z = 0.764, 1.407$ (allow 1.41)	M1 M1 A1, A1 [4]	M1 for correct order of operations M1 for a valid attempt at a second solution A1 for each

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2)

3 $\frac{1-\cos^2 \theta}{\sec^2 \theta - 1} = \frac{\sin^2 \theta}{\tan^2 \theta}$ $= \cos^2 \theta$ $= 1 - \sin^2 \theta$ <p>Alt Scheme</p> $\frac{1-\cos^2 \theta}{\sec^2 \theta - 1} = \frac{\sin^2 \theta}{1 - \cos^2 \theta / \cos^2 \theta}$ $= \frac{\sin^2 \theta \cos^2 \theta}{\sin^2 \theta}$ $= \cos^2 \theta$ $= 1 - \sin^2 \theta$	M1 M1 M1 A1 [4]	M1 for use of $1 - \cos^2 \theta = \sin^2 \theta$ M1 for use of $\sec^2 \theta - 1 = \tan^2 \theta$ M1 for attempt to simplify M1 for use of $1 - \cos^2 \theta = \sin^2 \theta$ M1 for attempting to get all in terms of cos M1 for attempt to simplify
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3)

11 (a) (i) $\tan x = 1.5$ 56.3 236.3	B1 B1 B1 $\sqrt{ }$
(ii) uses $\sin^2 y = 1 - \cos^2 y$ $2\cos^2 y + 3\cos y - 2 = 0$ solve 3-term quadratic 60 300	M1 A1 M1 A1 A1 $\sqrt{ }$

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4)

10 (i) $\tan x = 0.25$ $x = 14.0^\circ, 194.0^\circ$	M1 A1, √A1 [3]	M1 for use of tan
(ii) $3 + \sin y = 3(1 - \sin^2 y)$ $3\sin^2 y + \sin y = 0$ $\sin y(3\sin y + 1) = 0$ $\sin y = 0, \sin y = -\frac{1}{3}$ $y = 180^\circ,$ $y = 199.5^\circ, 340.5^\circ$	M1 DM1 B1 A1 √A1 [5]	M1 for use of correct identity and attempt to simplify DM1 for attempt to solve quadratic B1 for 180° A1 for 189.5° Ft on their 189.5°
(iii) $\cos \frac{z}{3} = \frac{1}{4}$ $\frac{z}{3} = 1.3181$ leading to $z = 3.95$ Allow $3.96, 1.25\pi, 1.26\pi$	B1 M1 A1 [3]	B1 for $\cos \frac{z}{3} = \frac{1}{4}$ or equivalent in terms of cos M1 for a correct order of operations (allow π)

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5)

4 (a) $p^2 + (2p)^2 = 1$ or $\cot x = 2$	B1
$p = \frac{1}{\sqrt{5}}$ or $\operatorname{cosec}^2 x = 1 + \cot^2 x \Rightarrow \operatorname{cosec} x = \sqrt{5}$	B1
$\operatorname{cosec} x = \sqrt{5}$ or $p = \frac{1}{\sqrt{5}}$	B1√
(b) $\cot^2 x - \tan^2 x$ oe $\operatorname{cosec}^2 x - 1 = (\sec^2 x - 1)$ or other relevant use of Pythagoras Correctly reaches conclusion $\frac{1}{\sin^2 x} - \frac{1}{\cos^2 x}$	B1 M1 A1 [6]

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6)

1 $\frac{(1+\cos\theta)+(1-\cos\theta)}{(1+\cos\theta)(1-\cos\theta)}$ $= \frac{2}{1-\cos^2\theta}$ $= \frac{2}{\sin^2\theta}$ $= 2 \operatorname{cosec}^2\theta$	M1 M1 A1 [3]	M1 for attempt to deal with fractions M1 for attempt at simplification and use of $1 - \cos^2\theta = \sin^2\theta$ in denominator
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7)

<p>11 (i) $2 \csc^2 x - 5 \csc x - 3 = 0$</p> $(2 \csc \theta + 1)(\csc \theta - 3) = 0$ <p>leading to $\sin x = \frac{1}{3}$, $x = 19.5^\circ, 160.5^\circ$</p> <p>(ii) $\tan 2y = \frac{5}{4}$</p> $2y = 51.34^\circ, 231.34^\circ$ $y = 25.7^\circ, 115.7^\circ$ <p>(iii) $\left(z + \frac{\pi}{6}\right) = \frac{2\pi}{3}, \frac{4\pi}{3}$</p> $z = \frac{2\pi}{3} - \frac{\pi}{6} \quad \left(\frac{4\pi}{3} - \frac{\pi}{6}\right)$ $z = \frac{\pi}{2}, \frac{7\pi}{6} \quad \text{allow } 1.57, 3.67$	<p>M1A1</p> <p>DM1</p> <p>A1\A1</p> <p>M1</p> <p>M1</p> <p>A1,\A1</p> <p>M1</p> <p>A1, A1 [12]</p>	<p>M1 for use of correct identity or attempt to get in terms of $\sin x$</p> <p>DM1 for attempt to solve</p> <p>$\sqrt{180^\circ - \text{their } x}$</p> <p>M1 for attempt to get in terms of tan</p> <p>M1 for dealing correctly with double angle</p> <p>$\sqrt{90^\circ}$ their y</p> <p>M1 for dealing with order correctly and attempt to solve</p>
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