Reciprocal Trig. - Past Edexcel Exam Questions

1. **(Question 8 - C3 June 2018)**

8. (a) By writing $\sec\theta = \frac{1}{\cos\theta}$, show that $\frac{\mathrm{d}}{\mathrm{d}\theta}(\sec\theta) = \sec\theta\tan\theta$

(2)

(b) Given that

$$x = \mathrm{e}^{\sec y} \qquad x > \mathrm{e}, \qquad 0 < y < \frac{\pi}{2}$$

show that

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{1}{x\sqrt{\mathrm{g}(x)}}, \qquad x > \mathrm{e}$$

where $\mathrm{g}(x)$ is a function of $\ln x$.

(5)

2. **(Question 4 - C3 June 2017)**

4. (a) Write $5\cos\theta - 2\sin\theta$ in the form $R\cos(\theta + \alpha)$, where R and α are constants, $R > 0$ and $0 \leqslant \alpha < \frac{\pi}{2}$

Give the exact value of R and give the value of α in radians to 3 decimal places.

(3)

(b) Show that the equation

$$5\cot 2x - 3\operatorname{cosec} 2x = 2$$

can be rewritten in the form

$$5\cos 2x - 2\sin 2x = c$$

where c is a positive constant to be determined.

(2)

(c) Hence or otherwise, solve, for $0 \leqslant x < \pi$,

$$5\cot 2x - 3\operatorname{cosec} 2x = 2$$

giving your answers to 2 decimal places.

(*Solutions based entirely on graphical or numerical methods are not acceptable.*)

(4)

3. **(Question 8 - C3 June 2016)**

8. (a) Prove that

$$2\cot 2x + \tan x \equiv \cot x \qquad x \neq \frac{n\pi}{2}, n \in \mathbb{Z}$$

(4)

(b) Hence, or otherwise, solve, for $-\pi \leqslant x < \pi$,

$$6\cot 2x + 3\tan x = \operatorname{cosec}^2 x - 2$$

Give your answers to 3 decimal places.

(*Solutions based entirely on graphical or numerical methods are not acceptable.*)

(6)

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4. **(Question 1 - C3 June 2015)**

1. Given that

$$\tan\theta° = p, \text{ where } p \text{ is a constant, } p \neq \pm 1$$

use standard trigonometric identities, to find in terms of p,

(a) $\tan 2\theta°$

(2)

(b) $\cos\theta°$

(2)

(c) $\cot(\theta - 45)°$

(2)

Write each answer in its simplest form.

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5. **(Question 7 - C3 June 2014)**

7. (a) Show that

$$\operatorname{cosec} 2x + \cot 2x = \cot x, \qquad x \neq 90n°, \qquad n \in \mathbb{Z}$$

(5)

(b) Hence, or otherwise, solve, for $0 \leqslant \theta < 180°$,

$$\operatorname{cosec}(4\theta + 10°) + \cot(4\theta + 10°) = \sqrt{3}$$

You must show your working.

(*Solutions based entirely on graphical or numerical methods are not acceptable.*)

(5)

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6. **(Question 5 - C3 June 2012)**

5. (a) Express $4\operatorname{cosec}^2 2\theta - \operatorname{cosec}^2\theta$ in terms of $\sin\theta$ and $\cos\theta$.

(2)

(b) Hence show that

$$4\operatorname{cosec}^2 2\theta - \operatorname{cosec}^2\theta = \sec^2\theta$$

(4)

(c) Hence or otherwise solve, for $0 < \theta < \pi$,

$$4\operatorname{cosec}^2 2\theta - \operatorname{cosec}^2\theta = 4$$

giving your answers in terms of π.

(3)

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7. **(Question 6 - C3 June 2011)**

6. (a) Prove that

$$\frac{1}{\sin 2\theta} - \frac{\cos 2\theta}{\sin 2\theta} = \tan\theta, \quad \theta \neq 90n°, \ n \in \mathbb{Z}$$

(4)

(b) Hence, or otherwise,

(i) show that $\tan 15° = 2 - \sqrt{3}$,

(3)

(ii) solve, for $0 < x < 360°$,

$$\operatorname{cosec} 4x - \cot 4x = 1$$

(5)

Solutions

1. (a) -
   (b) -
2. (a) $R = \sqrt{29}$, $\alpha = 0.381$
   (b) $c = 3$
   (c) $x = 0.30, 2.46$
3. (a) -
   (b) $x = -2.848, -1.277, 0.294, 1.865$
4. (a) $\frac{2p}{1-p^2}$
   (b) $\sqrt{\frac{1}{1+p^2}}$
   (c) $\frac{1+p}{p-1}$
5. (a) -
   (b) $\theta = 12.5°, 102.5°$
6. (a) $\frac{1-\cos^2(\theta)}{\sin^2(\theta)\cos^2(\theta)}$
   (b) -
   (c) $\theta = \frac{\pi}{3}, \frac{2\pi}{3}$
7. (a) -
   (b) i. -
   ii. $x = 22.5°, 112.5°, 202.5°, 292.5°$