

Reciprocal trigonometric functions

A-level Pure Mathematics (Year 2) | Edexcel 9MA0 | 12 questions, 58 marks

A-level Maths topic practice



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1 Find the exact value of

a. $\sec \frac{3\pi}{4}$

b. $\operatorname{cosec} \frac{\pi}{3}$

c. $\cot \frac{7\pi}{6}$

(3 marks)

Answer _____

2 Solve, for $0 \leq x < 2\pi$, the equation

$$2 \operatorname{cosec} x = 5$$

Give your answers to 3 significant figures.

(3 marks)

Answer _____

3 a. For $y = \arcsin x$, state the largest possible domain and the corresponding range.

b. Find the exact value of x for which $\arccos(2x - 1) = \frac{\pi}{3}$

(4 marks)

Answer _____

4 Given that $\tan \theta = -2$, where $\frac{\pi}{2} < \theta < \pi$, find the exact value of

- a. $\sec \theta$
- b. $\operatorname{cosec} \theta$

(4 marks)

Answer _____

5 Prove that

$$\sec^2 \theta + \operatorname{cosec}^2 \theta \equiv \sec^2 \theta \operatorname{cosec}^2 \theta$$

(3 marks)

Answer _____

6 Solve, for $0 \leq x < 360^\circ$, the equation

$$\tan^2 x = 2 \sec x + 2$$

Give your answers to 1 decimal place where appropriate.

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

(5 marks)

Answer _____

7 Solve, for $0 \leq \theta < 2\pi$, the equation

$$3 \cot^2 \theta - 5 \operatorname{cosec} \theta + 1 = 0$$

Give your answers as exact multiples of π .

(5 marks)

Answer _____

- 8 Solve, for $0 \leq x < 2\pi$, the equation
 $\operatorname{cosec} x = 4 \cos x$
Give your answers as exact multiples of π .

(4 marks)

Answer _____

- 9 a. Sketch the graph of $y = 3 - 2 \sec x$ for $0 \leq x \leq 2\pi$. Show the coordinates of the end points and of any turning points, and the equations of any asymptotes.
b. Hence state the set of values of k for which the equation $3 - 2 \sec x = k$ has no solutions.



(6 marks)

Answer _____

10 The function f is defined by

$$f(x) = \pi - 2 \arccos\left(\frac{x}{3}\right)$$

- State the largest possible domain of f .
- Find the range of f .
- Solve the equation $f(x) = \frac{\pi}{3}$

(5 marks)

Answer _____

11 a. Prove that

$$\frac{1 + \sec \theta}{\tan \theta + \sin \theta} \equiv \operatorname{cosec} \theta, \quad \theta \neq \frac{n\pi}{2}, n \in \mathbb{Z}$$

b. Hence solve, for $0 < x < 2\pi$, the equation

$$\frac{1 + \sec x}{\tan x + \sin x} + \cot^2 x = 5$$

Give exact answers where possible and other answers to 3 significant figures.

(8 marks)

Answer _____

12

A ladder rests on horizontal ground at A and leans against a vertical wall at B . On its way it rests on the top edge F of a fence. The fence is 2 m tall, parallel to the wall and 1 m in front of it. The ladder makes an angle θ radians with the ground, where $0 < \theta < \frac{\pi}{2}$. The ladder is modelled as a straight rod AB of length L metres that just touches F .

- Show that $L = 2 \operatorname{cosec} \theta + \sec \theta$
- Show that $\frac{dL}{d\theta} = 0$ when $\tan^3 \theta = 2$
- Given that this gives the shortest ladder that can reach the wall over the fence, find this shortest length. Give your answer to 3 significant figures.

(8 marks)

Answer _____

End of questions | Total 58 marks