Marked example 3

Paper 2 style · Graphic display calculator

3 7 marks AHL 3.9 ●●○ Typical

Consider the equation $2\cot^2 x + 3\operatorname{cosec} x = 4$, for $0 < x < 2\pi$, $x \neq \pi$.

(a) Show that the equation can be written as $2\operatorname{cosec}^2 x + 3\operatorname{cosec} x - 6 = 0$. **[2]**

(b) Hence solve the equation. **[5]**

MARKSCHEME (a)

$2\left(\operatorname{cosec}^2 x - 1\right) + 3\operatorname{cosec} x = 4$ **M1**

$2\operatorname{cosec}^2 x + 3\operatorname{cosec} x - 6 = 0$ **A1**

Total 2 marks

Note Using $\cot^2 x = \operatorname{cosec}^2 x - 1$.

Note AG.

MARKSCHEME (b)

$\operatorname{cosec} x = 1.13746$ or $\operatorname{cosec} x = -2.63746$ **(M1)A1**

$\sin x = 0.879153$ or $\sin x = -0.379153$ **M1**

$x = 1.07,\ x = 2.07$ **A1**

$x = 3.53,\ x = 5.89$ **A1**

Total 5 marks

Note $\frac{-3 \pm \sqrt{57}}{4}$.

Note Taking reciprocals; both values have $|\sin x| < 1$, so both give solutions.

Written and verified by a practising IB mathematics teacher, produced with AI assistance; solved twice and recomputed by software.
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