Marked example 3

Paper 2 style · Graphic display calculator

3 6 marks AHL 3.9 ●●○ Typical

Let $f(x) = \arccos\left(\frac{x}{2}\right) - \arctan x$, for $-2 \leq x \leq 2$.

(a) Find the exact value of $f\left(\sqrt{3}\right)$. **[1]**

(b) Solve the equation $f(x) = 1$. **[2]**

(c) Find the range of f. **[3]**

MARKSCHEME (a)

$\frac{\pi}{6} - \frac{\pi}{3} = -\frac{\pi}{6}$ **A1**

Total 1 mark

MARKSCHEME (b)

$\arccos\left(\frac{x}{2}\right) - \arctan x = 1$ **(M1)**

$x = 0.392$ **A1**

Total 2 marks

Note For example, the graphs of $y = f(x)$ and $y = 1$ intersected.

MARKSCHEME (c)

f is decreasing, since $\arccos\frac{x}{2}$ and $-\arctan x$ both decrease **R1**

$f(2) = -\arctan 2 = -1.11,\ f(-2) = \pi + \arctan 2 = 4.25$ **A1**

$-1.11 \leq f(x) \leq 4.25$ **A1**

Total 3 marks

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