Marked example 2

Paper 1 style · No calculator

2 7 marks AHL 3.9 ●●○ Typical

Let $f(x) = 3\sin(2x) + 1$, for $-\frac{\pi}{4} \leq x \leq \frac{\pi}{4}$.

(a) Find the range of f. **[2]**

(b) Find an expression for $f^{-1}(x)$, and state its domain. **[3]**

(c) Solve the equation $f^{-1}(x) = \frac{\pi}{12}$. **[2]**

MARKSCHEME (a)

$f\left(-\frac{\pi}{4}\right) = -2,\ f\left(\frac{\pi}{4}\right) = 4$ **A1**

$-2 \leq f(x) \leq 4$ **A1**

Total 2 marks

Note Either value.

MARKSCHEME (b)

$x = 3\sin(2y) + 1,\ \sin(2y) = \frac{x-1}{3}$ **M1**

$f^{-1}(x) = \frac{1}{2}\arcsin\left(\frac{x-1}{3}\right)$ **A1**

$-2 \leq x \leq 4$ **A1**

Total 3 marks

Note Interchanging x and y, at any stage.

MARKSCHEME (c)

$\arcsin\left(\frac{x-1}{3}\right) = \frac{\pi}{6},\ \frac{x-1}{3} = \frac{1}{2}$ **M1**

$x = \frac{5}{2}$ **A1**

Total 2 marks

Note Or $x = f\left(\frac{\pi}{12}\right)$.

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