Marked example 3

Paper 2 style · Graphic display calculator

3 6 marks AHL 3.10 · 3.11 ●●○ Typical

Let $f(x) = 2\sin\left(x + \frac{\pi}{6}\right) + \cos 2x$, for $0 \leq x \leq 2\pi$.

(a) Show that $f(x) = \sqrt{3}\sin x + \cos x + \cos 2x$. **[2]**

(b) Find the maximum value of f, and the value of x at which it occurs. **[2]**

(c) Solve the equation $f(x) = 0$. **[2]**

MARKSCHEME (a)

$2\left(\sin x \cos\frac{\pi}{6} + \cos x \sin\frac{\pi}{6}\right) + \cos 2x$ **M1**

$= 2\left(\frac{\sqrt{3}}{2}\sin x + \frac{1}{2}\cos x\right) + \cos 2x = \sqrt{3}\sin x + \cos x + \cos 2x$ **A1**

Total 2 marks

Note AG.

MARKSCHEME (b)

$2.30\ \ (2.29813\ldots)$ **A1**

at $x = 0.349\ \ (\frac{\pi}{9})$ **A1**

Total 2 marks

MARKSCHEME (c)

$x = \pi\ \ (3.14)$ **A1**

$x = 5.63$ **A1**

Total 2 marks

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