Marked example 2

Paper 1 style · No calculator

2 7 marks AHL 1.10 ●●○ Typical

Consider the function $f(x) = \sqrt{1+4x}$.

(a) Find the binomial expansion of $f(x)$ in ascending powers of x, up to and including the term in x^3. **[3]**

(b) State the set of values of x for which this expansion is valid. **[1]**

(c) By choosing a suitable value of x, use your answer to part (a) to find an approximation to $\sqrt{26}$, correct to five decimal places. **[3]**

MARKSCHEME (a)

$1 + \frac{1}{2}(4x) + \frac{\frac{1}{2}\left(-\frac{1}{2}\right)}{2!}(4x)^2 + \frac{\frac{1}{2}\left(-\frac{1}{2}\right)\left(-\frac{3}{2}\right)}{3!}(4x)^3$ **(M1)**

$= 1 + 2x - 2x^2 + 4x^3$ **A2**

Total 3 marks

Note A1 for two correct terms after 1.

MARKSCHEME (b)

$|4x| < 1,\ -\frac{1}{4} < x < \frac{1}{4}$ **A1**

Total 1 mark

MARKSCHEME (c)

$\sqrt{26} = 5\sqrt{1.04} = 5\,f(0.01)$ **(M1)**

$5(1 + 0.02 - 0.0002 + 0.000004)$ **(A1)**

≈ 5.09902 **A1**

Total 3 marks

Note $x = 0.01$ lies inside the interval of part (b).

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