Maclaurin series

Answers

Further Maths topic practice

This topic online

Q	Answer	Marks
1	**a)** $\ln 2 + (1/2)x - (1/8)x^2 + (1/24)x^3$ **b)** 0.741939	5
2	**a)** $x - 2x^3 + (2/3)x^5$ **b)** $-3x - (9/2)x^2 - 9x^3$, valid for $-1/3 \leq x < 1/3$	5
3	**a)** $\sin x = x - x^3/6$; $\ln(1 + x) = x - x^2/2 + x^3/3$ **b)** $x - (1/2)x^2 + (1/6)x^3$	5
4	**a)** $3x - (3/2)x^2 + 3x^3$ **b)** $-1/2 < x \leq 1/2$ **c)** 45/64 ($x = 1/4$) **d)** 1.44%	8
5	**a)** Shown: $f(0) = 0$, $f'(0) = 0$, $f''(0) = -1$, $f'''(0) = 0$, $f''''(0) = -2$ **b)** $-2x^2 - (4/3)x^4$	6
6	**a)** $x - (1/3)x^3$ **b)** $16\sqrt{3}/9$	6
7	**a)** $k = -4$ **b)** $1 + x - (1/3)x^3 - (1/6)x^4 - (1/30)x^5$	8
8	**a)** $1 - x^2 + (1/2)x^4 - (1/6)x^6$ **b)** 0.53511 **c)** 0.53515 **d)** It differs by about 0.00004 (about 0.008%), so it is accurate to 3 decimal places: very accurate	7
9	**a)** $e^{2x} = 1 + 2x + 2x^2 + (4/3)x^3$; $\sin x = x - x^3/6$ **b)** 2 **c)** 9/2	8
10	**a)** Shown; valid for $-1 < x < 1$ **b)** $x^{2r + 1}/(2r + 1)$, $r = 0, 1, 2, \ldots$ **c)** 263/240 **d)** 0.253%	9
11	**a)** Shown: $dy/dx = y/\sqrt{(1 - x^2)}$; square both sides **b)** Shown: differentiate implicitly and divide by 2 dy/dx **c)** $1 + x + (1/2)x^2 + (1/3)x^3 + (5/24)x^4$	10
12	**a)** $k = 1\,536\,000$ **b)** (i) 11.25 m (ii) 11.78 m **c)** 4.56% and 0.0847% **d)** The terms left out (x^4/k and higher powers) are tiny near $x = 0$ but grow quickly as $\lvert x \rvert$ increases, so the error is biggest near the pylons	9

Full worked solutions, written out by hand, are on the solutions sheet for this topic.

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