

JC1 H2 Mathematics (9758) Term 4 Revision Topical Quick Check Chapter 9 Maclaurin Series

1 EJC Promo 9758/2022/Q2

It is given that $y = e^{2x} \cos x$.

(a) Show that
$$\frac{d^2 y}{dx^2} = 4 \frac{dy}{dx} - 5y.$$
 [3]

(b) Find the Maclaurin series for y up to the term in x^2 . [2]

(c) Hence, show that the Maclaurin series for $e^x \sqrt{\cos x}$ is $1 + x + \frac{1}{4}x^2$, up to the term in x^2 . [2]

2 MI PU2 P2 Promo 9758/2022/Q6(modified)

It is given that $y = \ln(\cos x)$.

(i) Find the Maclaurin series for $\ln(\cos x)$ up to and including the term in x^4 . [2]

(ii) Hence, by substituting
$$x = \frac{\pi}{3}$$
, show that $\ln 2 \approx \frac{\pi^2}{18} + \frac{\pi^4}{972}$. [2]

3 ASRJC Promo 9758/2022/Q1

By finding the expansion of $(1+3x)^{-1}$ or otherwise, find the expansion of $\frac{\sqrt{1+2x}}{1+3x}$ in ascending powers of *x*, up to and including the term in x^2 . Find the range of values of *x* for which the expansion is valid. [4]

4 MI PU2 P2 Promo 9758/2022/Q2

In triangle *ABC*, angle *A* is $\left(\frac{\pi}{4} + \theta\right)$ radians and angle *B* is $\frac{1}{3}\pi$ radians. Show that when θ is sufficiently small for terms in θ^3 and higher powers of θ to be neglected,

$$\frac{AC}{BC} \approx \frac{\sqrt{6}}{2} \left(1 - \theta + k\theta^2 \right)$$

where *k* is a constant to be found.

[6]

Answer Key

No.	Year	JC	Answers
1	2022	EJC	(b) $y \approx 1 + 2x + \frac{3}{2}x^2$
2	2022	MI	(i) $\ln(\cos x) = -\frac{x^2}{2} - \frac{x^4}{12} + \dots$
3	2022	ASRJC	$1 - 2x + \frac{11}{2}x^{2} + \dots$ $-\frac{1}{3} < x < \frac{1}{3}$
4	2022	MI	$k = \frac{3}{2}$