FP2 Maclaurins Expansion

1. June 2010 qu.2

It is given that $f(x) = \tan^{-1}(1 + x)$.

(i) Find $f(0)$ and $f'(0)$, and show that $f''(0) = -\frac{1}{2}$. [4]

(ii) Hence find the Maclaurin series for $f(x)$ up to and including the term in x^2. [2]

2. June 2009 qu.3

(i) Given that $f(x) = e^{\sin x}$, find $f'(0)$ and $f''(0)$. [4]

(ii) Hence find the first three terms of the Maclaurin series for $f(x)$. [2]

3. Jan 2009 qu. 1

(i) Write down and simplify the first three terms of the Maclaurin series for e^{2x}. [2]

(ii) Hence show that the Maclaurin series for $\ln(e^{2x} + e^{-2x})$

begins $\ln a + bx^2$, where a and b are constants to be found. [4]

4. June 2008 qu. 7

It is given that $f(x) = \tanh^{-1}\left(\frac{1-x}{2+x}\right)$, for $x > -\frac{1}{2}$.

(i) Show that $f'(x) = -\frac{1}{1+2x}$, and find $f''(x)$. [6]

(ii) Show that the first three terms of the Maclaurin series for $f(x)$ can be written as $\ln a + bx + cx^2$, for constants a, b and c to be found. [4]

5. Jan 2008 qu. 1

It is given that $f(x) = \ln(1 + \cos x)$.

(i) Find the exact values of $f(0)$, $f'(0)$ and $f''(0)$. [4]

(ii) Hence find the first two non-zero terms of the Maclaurin series for $f(x)$. [2]

6. June 2007 qu. 2

(i) Given that $f(x) = \sin\left(2x + \frac{\pi}{4}\right)$, show that $f(x) = \frac{1}{2}\sqrt{2}\,(\sin 2x + \cos 2x)$ [2]

(ii) Hence find the first four terms of the Maclaurin series for $f(x)$. [You may use appropriate results given in the List of Formulae.] [3]

7. Jan 2007 qu. 1

It is given that $f(x) = \ln(3 + x)$.

(i) Find the exact values of (0) and f'(0), and show that $f''(0) = -\frac{1}{9}$. [3]

(ii) Hence write down the first three terms of the Maclaurin series for f(x), given that

$-3 < x \le 3$. [2]

8. June 2006 qu.1

Find the first three non-zero terms of the Maclaurin series for $(1 + x) \sin x$,

simplifying the coefficients. [3]

9. June 2006 qu.2

(i) Given that $y = \tan^{-1} x$, prove that $\frac{dy}{dx} = \frac{1}{1+x^2}$. [3]

(ii) Verify that $y = \tan^{-1} x$ satisfies the equation $(1+x^2)\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} = 0$. [3]

10. Jan 2006 qu.1

(i) Write down and simplify the first three non-zero terms of the Maclaurin series for

$\ln(1 + 3x)$. [3]

(ii) Hence find the first three non-zero terms of the Maclaurin series for $e^x \ln(1 + 3x)$,

simplifying the coefficients. [3]

11. June 2010 qu.3

Given that the first three terms of the Maclaurin series for $(1 + \sin x)e^{2x}$ are identical to the first three terms of the binomial series for $(1 + ax)^n$, find the values of the constants a and n. (You may use appropriate results given in the List of Formulae (MF1).)

[6]