

MH4718 Worksheet 9

1. Determine the Taylor expansion around 0 for

(i) $\cos(x)$,

(ii) $\sin(x)$,

(iii) e^{x^2} ,

(iv) $(x + 1)^{\frac{4}{3}}$.

2. Solve the following initial value problems by using Taylor series:

(i) $\frac{dy}{dx} = \sqrt{1 - y^2}, y(0) = 0$,

(ii) $\frac{dy}{dx} = -\sqrt{1 - y^2}, y(0) = 1$,

(iii) $\frac{dy}{dx} = \frac{4}{3}y^{\frac{1}{4}}, y(0) = 1$

(iv) $\frac{dy}{dx} = \frac{2y + 2}{x} - 2, y(1) = 2$

3. Write a C++ program which uses Euler's method to estimate a solution for each of the above initial value problems over a suitable interval of your choice. Get the program to output the values of the approximate solution and the C++ version of the exact solution to a text file. Import the text file into Excel and create a chart of the approximate solution and exact solution on the same axes.