

MAT341 Homework 7

1. a) Solve the ordinary differential equation by Frobenius Method.

$$x^2 y'' + xy' + \left(x^2 - \frac{1}{4}\right) y = 0$$

$y(0)$ is bounded.

- b) By comparing the solution of part a) to the Maclaurin series of $\sin x$, show that the solution to part a) is proportional to

$$\frac{\sin x}{\sqrt{x}}$$

2. Suppose $\Delta v(r, \theta) = 0$. Prove the mean value property

$$v(0, 0) = \frac{1}{2\pi} \int_0^{2\pi} v(r, \theta) d\theta$$

using formulas (10) and (11) of page 277 in your text book.

3. Solve the potential equation $\Delta v(r, \theta) = 0$ on the disc of radius 2 centered at the origin, where the boundary condition is

$$v(2, \theta) = \begin{cases} 1 & 0 \leq \theta < \pi \\ 0 & \pi \leq \theta < 2\pi. \end{cases}$$

Additional Homeworks

5.3 1,5,7(c)

5.4 5,7