PRAYAG 19IPMP03

School of Physics

Minor-1

Mathematical Methods(PY-401)

IMSc-7 Semesters, 2022

Answer all the questions. If answer to any question is written at more than one place, only first one will be evaluated. For every blanc space, half mark will be deducted.

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1. Solve the ODE

$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 8y = 0,$$

using method of extended series solution. Compare your result with known solutions, e^{-2x} and e^{8x}. (8)

2. Using Frobenius method find the solutions of $(x^2-1)x^2y'' - (x^2+1)xy' + (x^2+1)y = 0$. (12)

3. Verify that e^x is one of the solutions of the differential equation $xy'' - (x+1)y' + y = 0$ in the interval $x > 0$ and using this fact, find the second, linearly independent solution of this equation. (10)

4. Find all singular points of the equations given below and classify them as regular/irregular singular points: (10)
   (i) $(x+1)^2y'' + (x+1)y' + y = 0$,
   (ii) $(x-2)y'' + y' - xy = 0$