School of Physics
Minor-2
Mathematical Methods(PY-401)
IMSc-7 Semesters, 2022

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1. Give an example of a partial differential equation(where the coefficient functions are not constants) and then explain under what condition this equation will be hyperbolic. (4)

2. Solve

$$\frac{\partial^2 U}{\partial x^2} = 2xy$$

if $U(0, y) = y^2$ and $\frac{\partial U}{\partial x}|_{x=0} = y$. (8)

3. Plot the function

$$\begin{aligned} f(t) &= 0 \text{ for } 0 < t < 1 \\ &= (t-1)^2, \text{ for } t > 1 \end{aligned}$$

and find its Laplace transform. (4)

4. Find Laplace transform of $f(t) = \int_0^t x^2 e^x dx$ (2)

5. Find $f(t)$, if $F(s) = \frac{s^2+20s+9}{(s-1)^2(s-9)}$. (2)