Final Report

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Question 1: Bessels Function Solution

$$\begin{cases} U_t = \nu \left(U_{rr} + \frac{1}{r} U_r \right) & r \in [1,3], \quad t \geq 0 \\ U(r,0) = 15(r - r_1)^2 (r_2 - r)^2 e^{-\sin(2r) - r} \\ U(1,t) = 0 \\ U(3,t) = 0 \end{cases} \tag{1}$$

$$r_1 = 1, \quad r_2 = 3, \quad \nu = \frac{1}{4} \tag{2}$$

a) Plot the solution keeping 60 modes of the bessels function expansion at times 0, 0.5, 1, 2.

b) Plot the functions

Question 2: Finite Differences Solution

a)

Question 3: Prove Second Order Accuracy in Δr

a)