

MAE/MSE 502 Spring 2023 HW5 Solution

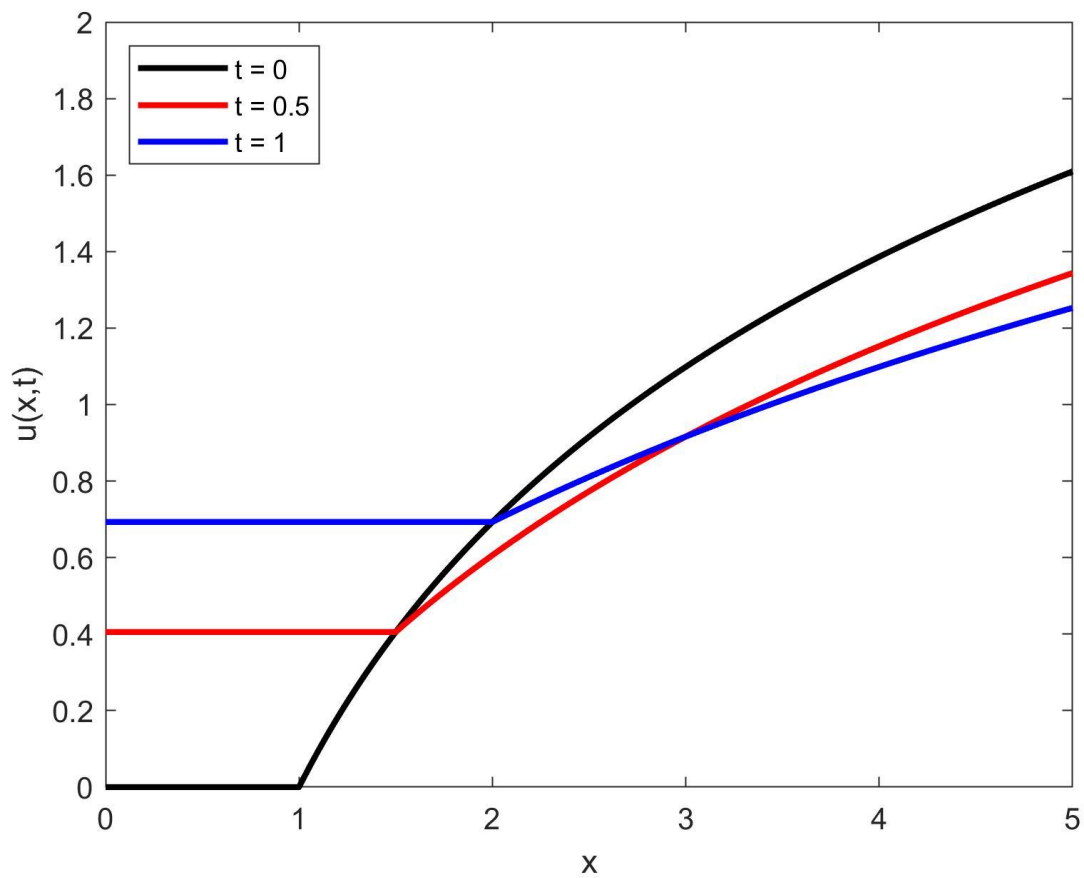
Problem 1

$$u(x, t) = -x + (1 + t)e^{3t}$$

Problem 2

$$u(x, t) = \begin{cases} \ln(1 + t), & \text{if } x < 1 + t \\ \ln\left(\frac{x}{1+t} + t\right), & \text{if } x \geq 1 + t \end{cases}$$

Plot:

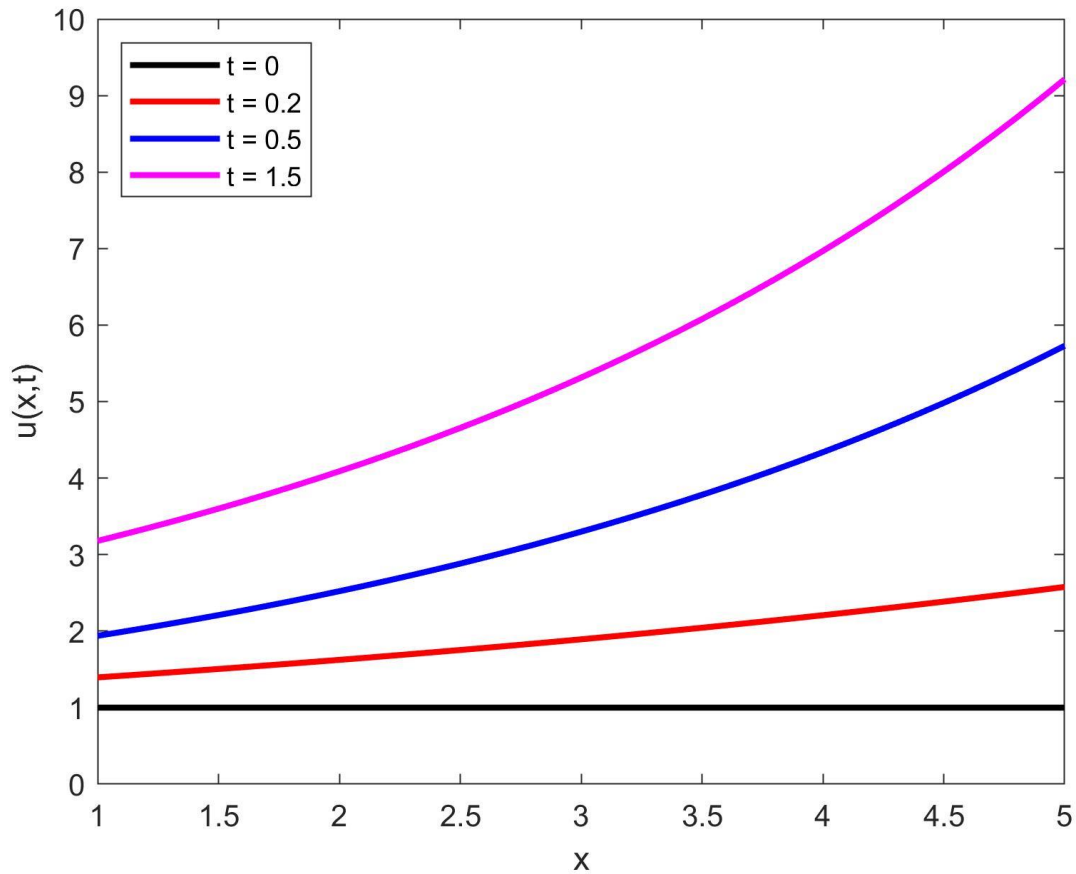


Problem 3

$$u(x, t) = e^{xte^{-t}} + \frac{e^{xte^{-t}} - 1}{xe^{-t}}$$

[Note: When $x = 0$, $u(x, t) = 1 + t$. This will not affect the plot since it does not cover $x = 0$.]

Plot:



Problem 4

$$u(x, t) = x + t + \frac{xt^2}{2}$$

[Note: The detailed hand derivation shows one approach. The other approach of using an alternative decomposition of the 2nd-order differential operator will also work.]