

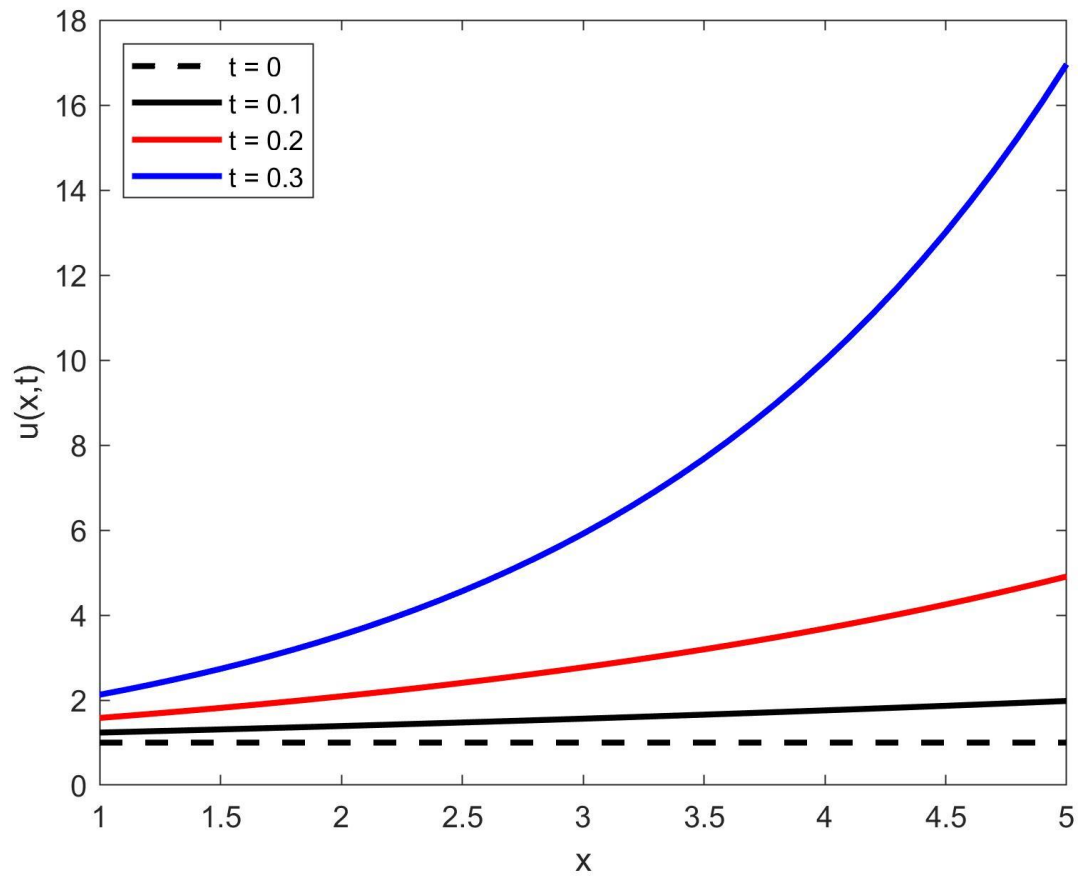
MAE/MSE 502 Fall 2022 HW5 Solution

Problem 1

$$u(x, t) = e^{xte^{2t}} + \frac{e^{xte^{2t}} - 1}{xe^{2t}}$$

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

Plot:



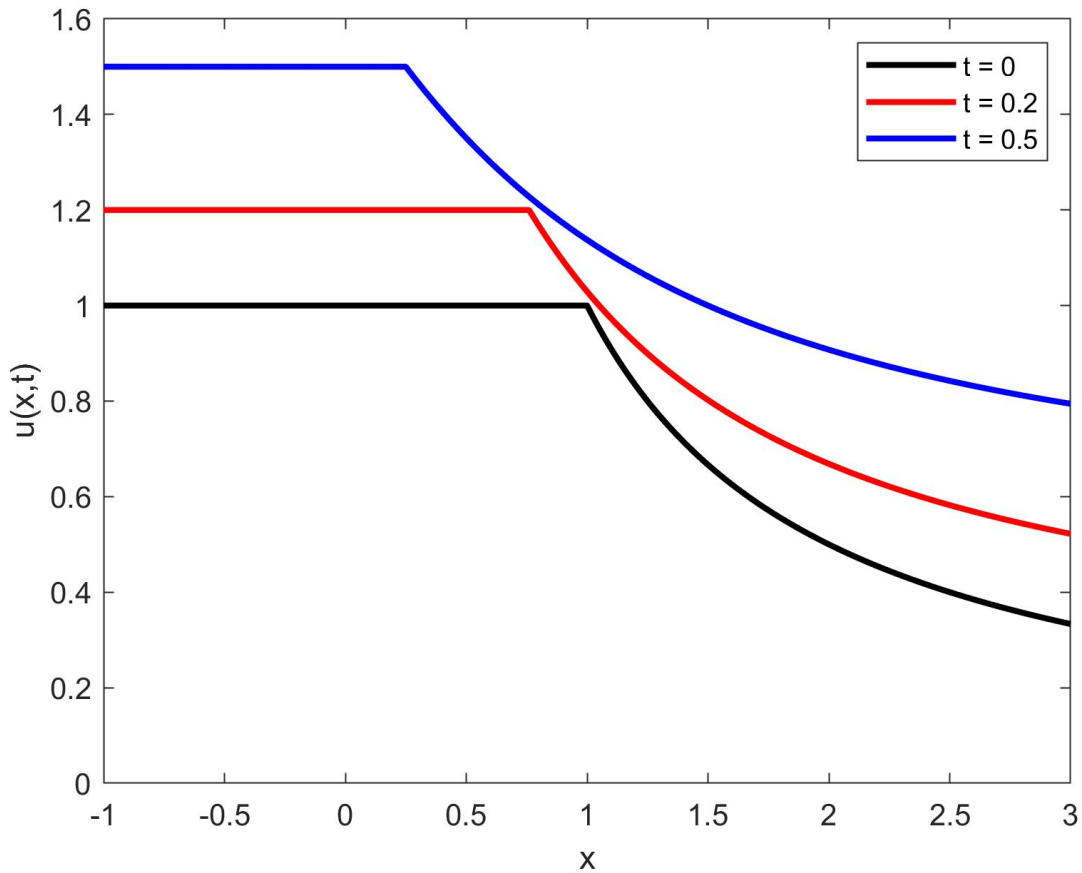
Problem 2

$$u(x, t) = -x + te^{2t}$$

Problem 3

$$u(x, t) = \begin{cases} 1 + t, & \text{if } x < 1 - t - 0.5t^2 \\ \frac{2}{(x + 0.5t^2) + \sqrt{(x + 0.5t^2)^2 + 4t}} + t, & \text{if } x \geq 1 - t - 0.5t^2 \end{cases}$$

Plot:



Problem 4

$$u(x, t) = x + 0.25 xt^2$$

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