

MAE/MSE 502 Fall 2021 HW5 Solution

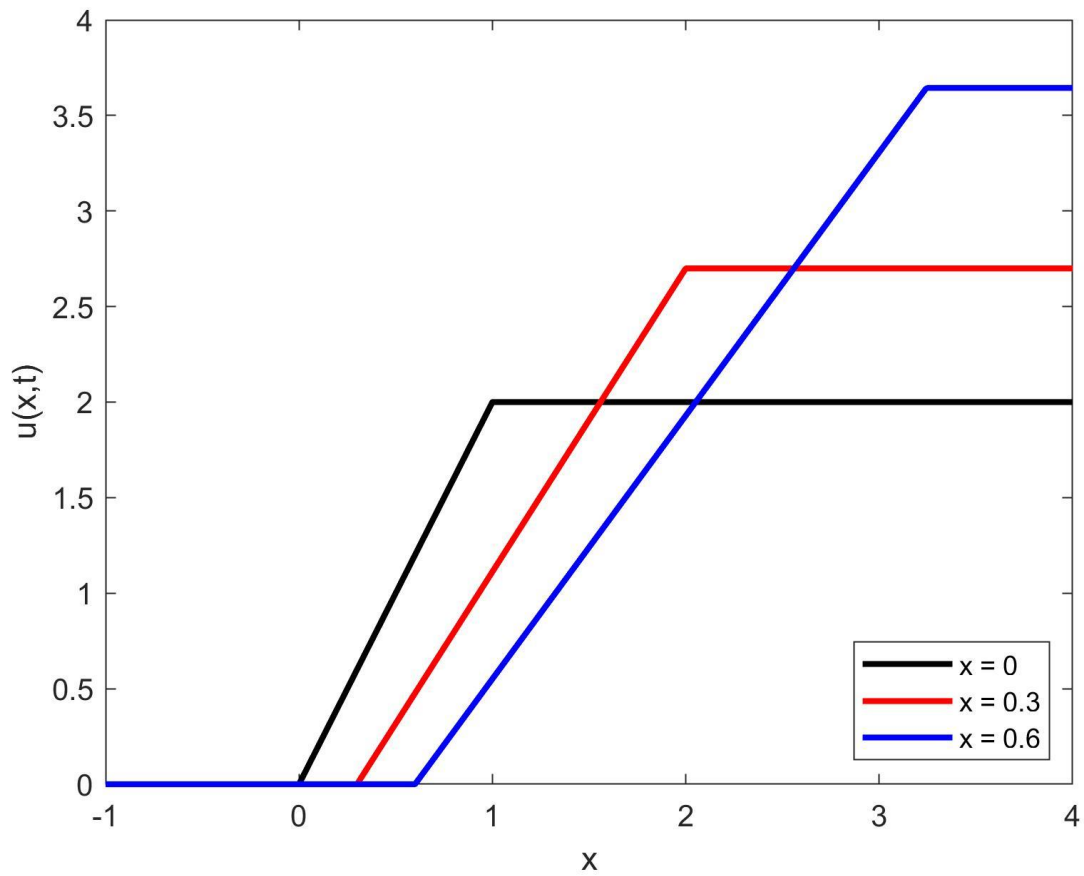
Problem 1

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

Problem 2

$$u(x, t) = \begin{cases} 0, & \text{if } x < t \\ \frac{2(x-t)e^t}{2e^t-1}, & \text{if } t \leq x \leq 2e^t-1+t \\ 2e^t, & \text{if } x > 2e^t-1+t \end{cases}$$

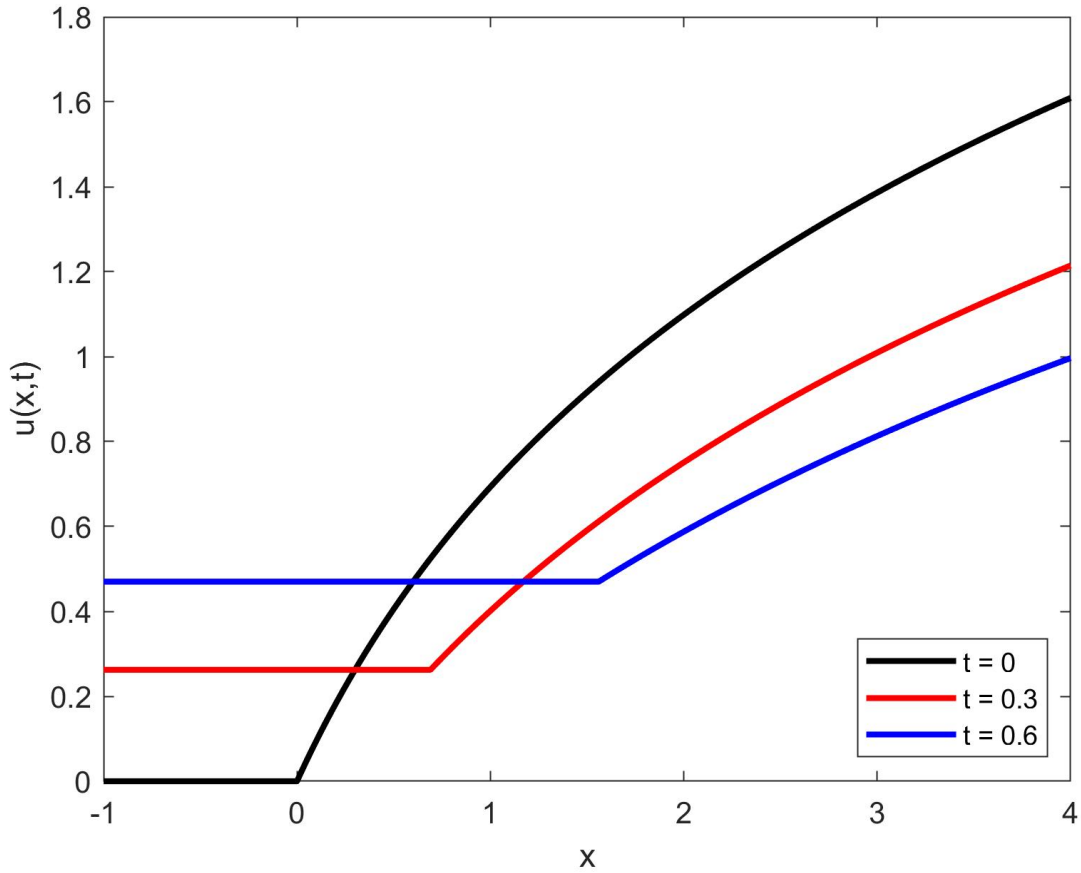
Plot:



Problem 3

$$u(x, t) = \begin{cases} \ln(t + 1), & \text{if } x < 2t + t^2 \\ \ln\left[\left(\frac{x - 2t - t^2}{1 + 2t}\right) + 1 + t\right], & \text{if } x \geq 2t + t^2 \end{cases}$$

Plot:



Problem 4

$$u(x, t) = \underbrace{[2 - e^{-t}]}_{A(t)} x + \underbrace{[3 - 2t - (3 + t)e^{-t}]}_{B(t)}$$

$$A(0.5) = 1.3935 \quad B(0.5) = -0.1229$$