

MAE/MSE 502, Fall 2022 HW4 Solution

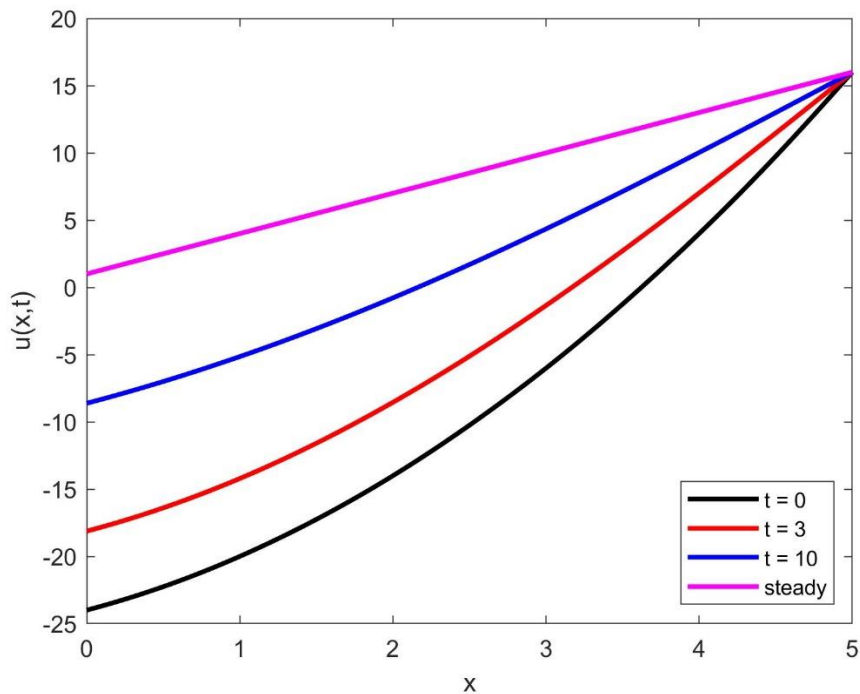
Problem 1

$$u(x, t) = (3x + 1) + \sum_{n=1}^{\infty} a_n \cos\left(\frac{n\pi x}{10}\right) e^{-\left(\frac{n\pi}{10}\right)^2 t},$$

where the summation goes over only odd values of n , and

$$a_n = \frac{2}{5} \int_0^5 (x^2 - 25) \cos\left(\frac{n\pi x}{10}\right) dx.$$

Plot:



Problem 2

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

Problem 3

$$u(x, t) = \sin(\pi x) e^{-\pi^2 t} + \cos(\pi x) + x - x^2$$

Problem 4

$$u(x, t) = (5 - 2e^{-t} - te^{-t}) + [1 - \cos(t)] \cos(x)$$