

MAE 502 Spring 2019 HW1 Solution

Prob 1

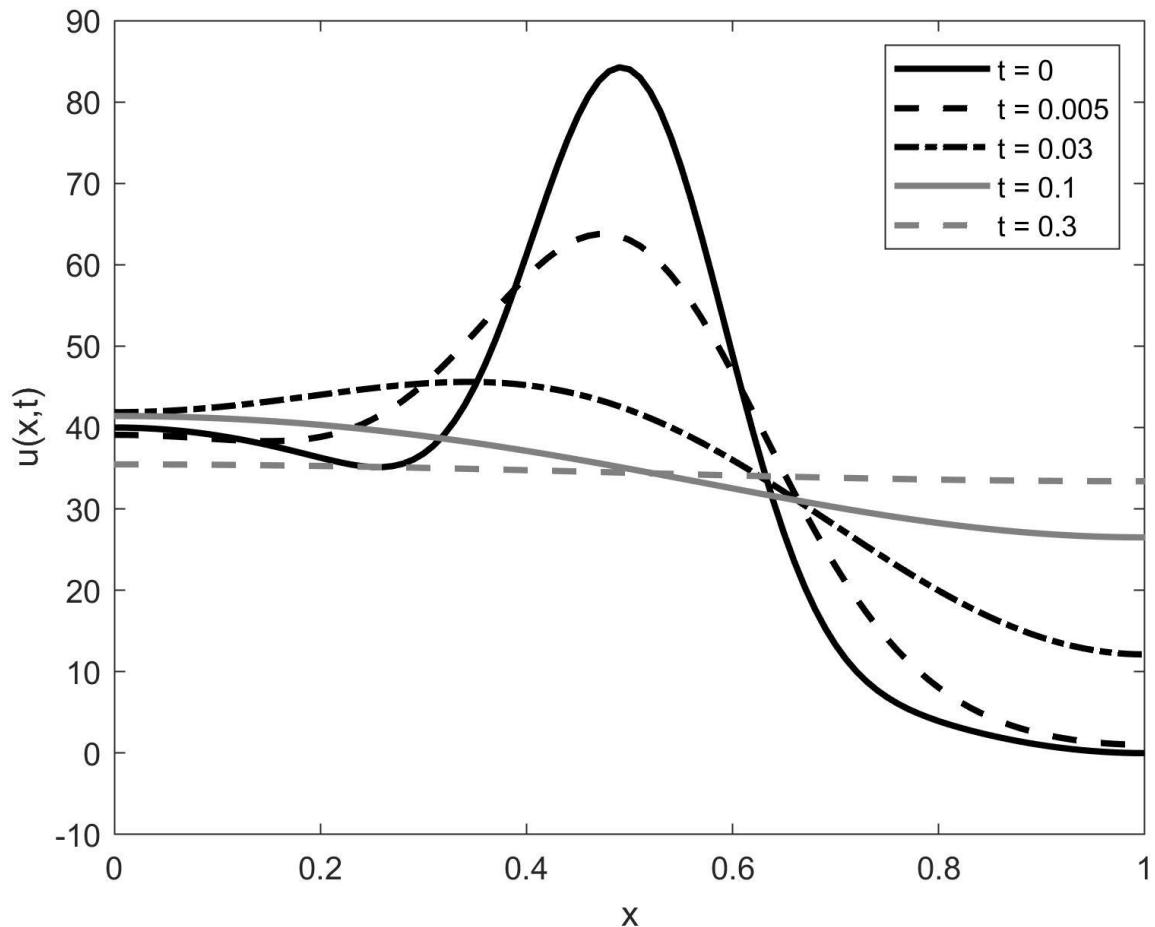
(a)

$$u(x, t) = a_0 + \sum_{n=1}^{\infty} a_n \cos(n\pi x) \exp(-(n\pi)^2 t)$$

where

$$a_0 = \int_0^1 P(x) dx, \text{ and } a_n = 2 \int_0^1 P(x) \cos(n\pi x) dx \text{ for } n > 0,$$

$P(x) = [1 - \cos(2\pi x)]^6 + 20 \cos(\pi x) + 20$, as given in the 3rd b.c.

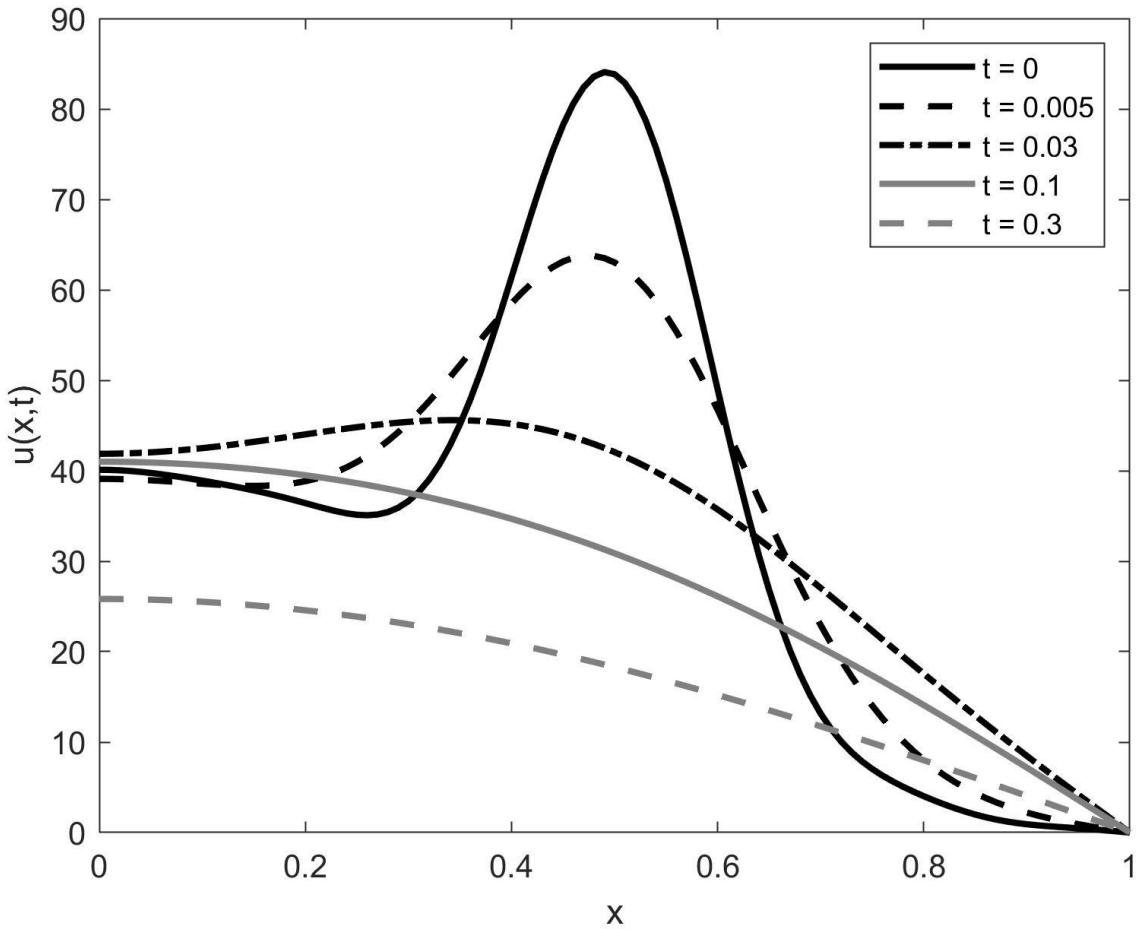


(b)

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

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

$$a_n = 2 \int_0^1 P(x) \cos\left(\frac{n\pi x}{2}\right) dx, \text{ for odd values of } n.$$



Prob 2

$$u(x, t) = e^{t^2/2} + \cos(3\pi x) e^{-9\pi^2(1-e^{-t})+t^2/2}$$

Prob 3

$$E(t) = \left(\frac{3}{2} + \frac{3}{2}t^2\right) e^{3t}$$

Prob 4

We will discuss the solution of this task in class.