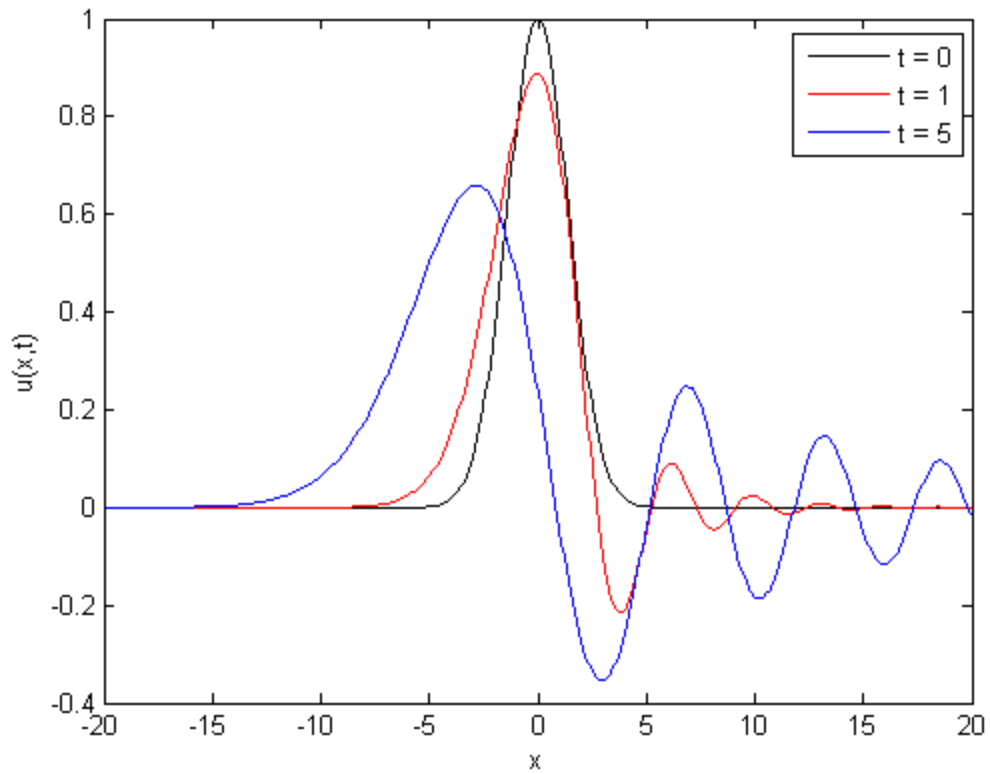


Prob 1

$$u(x, t) = \frac{2}{\sqrt{\pi}} \int_0^{\infty} e^{-\omega^2} \cos[\omega x + (\omega - \omega^3)t] d\omega$$

Plot:



Prob 2

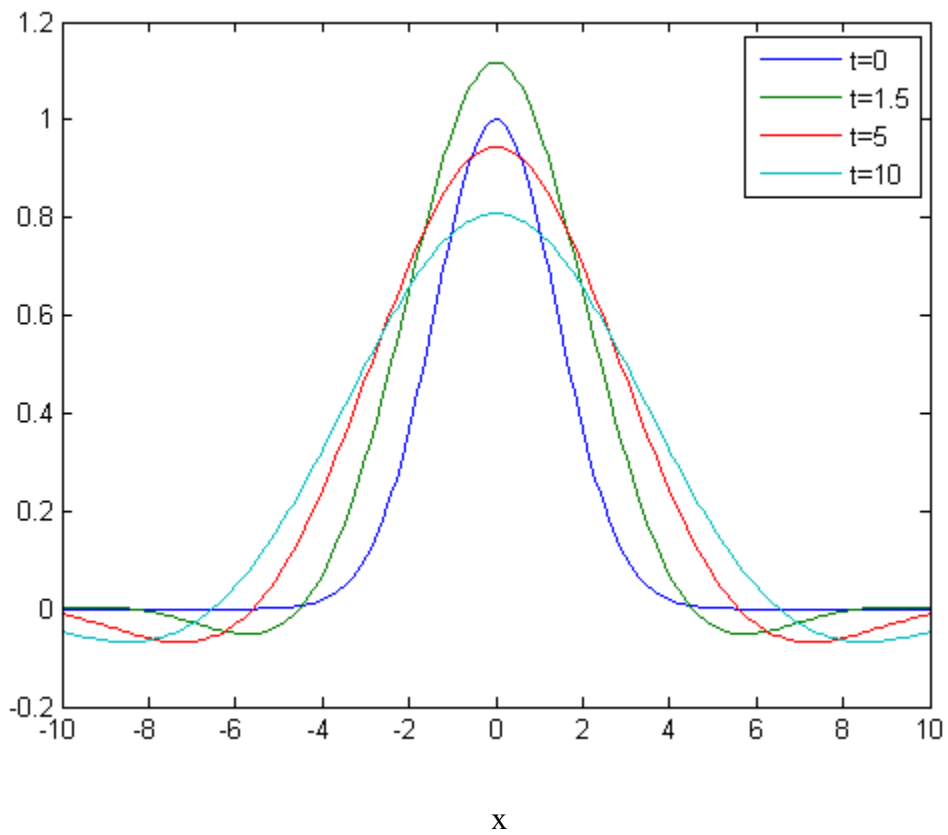
$$u(x, t) = 2 \int_0^{\infty} U(\omega, t) \cos(\omega x) d\omega ,$$

where

$$U(\omega, t) = \frac{1}{\sqrt{\pi}} e^{-\omega^2} e^{-\omega^4 t} + \left(\frac{e^{-\omega^2/4}}{2\sqrt{\pi}} \right) F(\omega, t) ,$$

$$F(\omega, t) = \frac{e^{-t} - e^{-\omega^4 t}}{\omega^4 - 1} , \text{ if } \omega \neq 1$$
$$= t e^{-\omega^4 t} , \text{ if } \omega = 1 .$$

Plot:



Prob 3

$$u(x, t) = e^t e^{-\frac{(x+3t)^2}{4}}$$

Prob 4

$$u(x, t) = 2 + 5t + \frac{t^2}{2} + e^{-\pi^2 t} \cos(\pi x) + \left[e^{-9\pi^2 t} + \frac{e^{-t} - e^{-9\pi^2 t}}{9\pi^2 - 1} \right] \cos(3\pi x)$$