Assignment 1

Find the Laplace transform of the following time functions ($f(t)=0$, $t<0$):

(1) $f(t)=(t+1)(t+5)$

(2) $f(t)=5(1-\cos 5t)$

(3) $f(t)=e^{-0.5t}\cos 10t$

(4) $f(t)=\sin(5t+\frac{\pi}{3})$

(5) $f(t)=1-e^{-\frac{1}{T}t}$

2. Find the Laplace transform of the following time functions shown in the figures below.

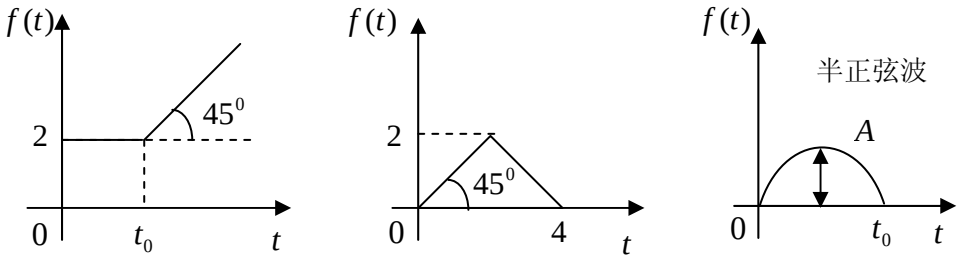

Fig. 1

3. Find the inverse Laplace transform of the following rational functions:

(1) $F(s)=\dfrac{s-2}{s^2+4}$

(2) $F(s)=\dfrac{1}{s(s+5)}$

(3) $F(s)=\dfrac{s+7}{(s+1)(s^2+3s+2)}$

(4) $F(s)=\dfrac{1}{s(s^2+s+1)}$

(5) $F(s)=\dfrac{10s}{s^2+4s+8}$

4. Solve the following differential equations by using Laplace transform:

(1) $\ddot{x}(t)+\dot{x}(t)+x(t)=\delta(t),\quad \dot{x}(0)=x(0)=0$

(2) $\ddot{x}(t) + 2\dot{x}(t) + x(t) = 1(t), \quad \dot{x}(0) = x(0) = 0$

(3) $\ddot{x}(t) + 3.5\dot{x}(t) + 1.5x(t) = 0, \quad \dot{x}(0) = x_0, x(0) = 0$