

中國文化大學 九十三 學年度 第二學期 期末 考試試卷					
考試科目	任課老師	系級	考試日期	份數	備註
工程數學	陳為仁	機二 A	94/01/19	75	closed books

- Find the given Laplace transform $L[\sin^2 t]$. (10)
- Find the given Laplace transform $L[4t \sin(2t)]$. (10)
- Find the given inverse Laplace transform $L^{-1}\left[\frac{2s-1}{(s-1)(s^2+4s+3)}\right]$. (10)
- Find the given inverse Laplace transform $L^{-1}\left[\frac{e^{-3s}}{s^2+2s+2}\right]$. (10)
- Use the Laplace transform to solve the following given initial value problem.

$$y'' + y = t, \quad y(0) = 1, \quad y'(0) = 0 \quad (20)$$
- Use the Laplace transform to solve the following given initial value problem.

$$y^{(3)} - 8y = g(t), \quad y(0) = y'(0) = y''(0) = 0; \quad (20)$$

$$g(t) = \begin{cases} 0 & 0 \leq t < 6 \\ 2 & t \geq 6 \end{cases}$$
- Use the Laplace transform to solve the following given initial value problem.

$$y'' + 5y' + 6y = 3\delta(t-2) - 4\delta(t-5), \quad y(0) = 0, \quad y'(0) = 0 \quad (20)$$
- Given the first-order differential equation $y' - 2xy = 0$, use the power series solution $y(x) = \sum_{n=0}^{\infty} a_n x^n$ into the equation to find (1) the recurrence relation and (2) the first five terms of the power series of the general solution. (20)

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Table of Laplace Transform

$f(t)$	$F(s)=L[f(t)]$
1	$1/s$
t	$1/s^2$
t^n	$n!/s^{n+1}$
e^{at}	$1/(s-a)$
$\sin(at)$	$a/(s^2+a^2)$
$\cos(at)$	$s/(s^2+a^2)$
$\sinh(at)$	$a/(s^2-a^2)$
$\cosh(at)$	$s/(s^2-a^2)$
$\delta(t-a)$	e^{-as}
$af(t)+bg(t)$	$aF(s)+bG(s)$
$f'(t)$	$sF(s)-f(0)$
$f^{(n)}(t)$	$s^n F(s)-s^{n-1}f(0)-\dots-f^{(n-1)}(0)$
$t^n f(t)$	$(-1)^n F^{(n)}(s)$
$e^{at}f(t)$	$F(s-a)$
$f(t-a)H(t-a)$	$e^{-as}F(s)$
$f(t+T)=f(t)$	$\frac{1}{1-e^{-Ts}} \int_0^T e^{-st} f(t) dt$