Chapter 4

Higher Order Differential Equations

4.1 Method of Undetermined Coefficients

Table 4.1: Particular Solutions for Undetermined Coefficients

g(x)		**Form of $\mathbf{y_p}$**
1.	1 (any constant)	A
2.	$5x + 7$	$Ax + B$
3.	$3x^2 - 2$	$Ax^2 + Bx + C$
4.	$x^3 - x + 1$	$Ax^3 + Bx^2 + Cx + E$
5.	$\sin 4x$	$A\cos 4x + B\sin 4x$
6.	$\cos 4x$	$A\cos 4x + B\sin 4x$
7.	e^{5x}	Ae^{5x}
8.	$(9x - 2)e^{5x}$	$(Ax + B)e^{5x}$
9.	x^2e^{5x}	$(Ax^2 + Bx + C)e^{5x}$
10.	$e^{3x}\sin 4x$	$Ae^{3x}\cos 4x + Be^{3x}\sin 4x$
11.	$5x^2\sin 4x$	$(Ax^2 + Bx + C)\cos 4x + (Ex^2 + Fx + G)\sin 4x$
12.	$xe^{3x}\cos 4x$	$(Ax + B)e^{3x}\cos 4x + (Cx + E)e^{3x}\sin 4x$

Chapter 6

Series Solutions of Linear Equations

6.1 Solving Linear DE's without constant coefficients

Table 6.1: Maclaurin Series Representations

Maclaurin Series		Interval of Convergence
$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots = \sum_{n=0}^{\infty} \frac{1}{n!} x^n$	(6.1)	$(-\infty, \infty)$
$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \cdots = \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n)!} x^{2n}$	(6.2)	$(-\infty, \infty)$
$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots = \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} x^{2n+1}$	(6.3)	$(-\infty, \infty)$
$\tan^{-1} x = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \cdots = \sum_{n=0}^{\infty} \frac{(-1)^n}{2n+1} x^{2n+1}$	(6.4)	$[-1, 1]$
$\cosh x = 1 + \frac{x^2}{2!} + \frac{x^4}{4!} + \frac{x^6}{6!} + \cdots = \sum_{n=0}^{\infty} \frac{1}{(2n)!} x^{2n}$	(6.5)	$(-\infty, \infty)$
$\sinh x = x + \frac{x^3}{3!} + \frac{x^5}{5!} + \frac{x^7}{7!} + \cdots = \sum_{n=0}^{\infty} \frac{1}{(2n+1)!} x^{2n+1}$	(6.6)	$(-\infty, \infty)$
$\ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \cdots = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n} x^n$	(6.7)	$(-1, 1]$
$\frac{1}{1-x} = 1 + x + x^2 + x^3 + \cdots = \sum_{n=0}^{\infty} x^n$	(6.8)	$(-1, 1)$

Chapter 7

Method of Laplace Transforms for Solving DE's

7.1 Definition of Laplace Transform

Table 7.1: Transforms of Some Basic Functions

$$\mathscr{L}\left\{1\right\} = \frac{1}{s} \tag{7.1}$$

$$\mathscr{L}\left\{t^n\right\} = \frac{n!}{s^{n+1}} \tag{7.2}$$

$$\mathscr{L}\left\{e^{at}\right\} = \frac{1}{s-a} \tag{7.3}$$

$$\mathscr{L}\left\{\sin kt\right\} = \frac{k}{s^2+k^2} \tag{7.4}$$

$$\mathscr{L}\left\{\cos kt\right\} = \frac{s}{s^2+k^2} \tag{7.5}$$

$$\mathscr{L}\left\{\sinh kt\right\} = \frac{k}{s^2-k^2} \tag{7.6}$$

$$\mathscr{L}\left\{\cosh kt\right\} = \frac{s}{s^2-k^2} \tag{7.7}$$

7.2 Solving I.V.T by using Laplace Transform