MAP 2302 – INTROD TO  DIFF EQUATIONS                   FLORIDA INT'L UNIV.   
Review for Test #3

      REMEMBER TO BRING AN 8’’x11”  BLUE EXAM BOOKLET FOR THE TEST

             MAIN PROBLEM SOLVING TECHNIQUES:

1.      How to solve Cauchy-Euler ODEs by putting x = et   [i.e.,  t = ln(x) ]

2.     How to find the indicial equation of a Cauchy-Euler ODE :  
 (a)  distinct real roots   (b) complex roots   (c) repeated real or complex roots.

3.    How to find the Power Series solution of ODEs near an ordinary point.   
4.      How to find the indicial equation of linear ODEs  near a regular singular point.  
5.   How to find the Series solution of linear ODEs near a regular singular point:  
        (a) r1-r2  is real number but not an integer  (b)  r1-r2  is zero

(c) r1-r2  is a positive integer   (d) r1 and r2  are complex numbers.  
*When r1 and r2 are real roots of the indicial equation, r1 > r2  by convention.*

6.     How to find the Laplace transform of  functions of exponential order.

7.      How to solve linear homogeneous & non-homogenous ODEs with constant

            coefficients and given initial conditions by using the Laplace transforms.

8.  How to solve systems of 2 linear homogeneous & non-homogenous ODEs

            with constant coefficients and given initial conditions by using the Laplace transforms.

       -----------  
9.   How to find inverse Laplace transforms by using the Convolution Theorem.

10.   How to solve linear non-homogeneous ODEs with constant coefficients and given

            intial conditions which have discontinuous RHS by using the Laplace transforms.

 

             MAIN DEFINITIONS:

Cauchy-Euler ODE, Linear second-order ODEs with variable coefficients,  Ordinary point, Power Series Method,  Recurrence formulas,  Regular singular point, Irregular singular point, Frobenius Method, Indicial Equation, Associated Cauchy-Euler ODE,  Laplace transform, Inverse Laplace transform,  Partial fraction method for finding inverse Laplace transforms, Laplace transforms of discontinuous functions, the Delta generalized-function.  Linear ODEs in one dependent variable,  Systems of two linear ODEs in two dependent variables.

             MAIN THEOREMS:

1. The theorems on Cauchy-Euler Ordinary Differential Equations when we have:

 (a)  distinct real roots   (b) complex roots   (c) repeated (real or complex) roots.

2.     The theorem on Power Series solutions near ordinary points of a linear ODE.

3.    The theorems on the Frobenius Method near regular singular points when:  
        (a) r1-r2  is real number but not an integer  (b)  r1-r2  is zero

(c) r1-r2  is a positive integer   (d) r1 and r2  are complex numbers.  
4.   If  L{f} = L{g} and f and g are continuous functions on  (0, infinity) then f = g.  
5.   L{f(n)(t)} = sn.L{f(t)} -  sn-1.f(0) -  sn-2.f (1)(0) -  .  .  .  -   s.f (n-2)(0) -  f (n-1)(0).  
             So  L{f*'*(t)} = s. L{f(t)} -  f (0)  and  L{f*''*(t)} = s2. L{f(t)} - s. f (0) -  f /(0).  
6.   L{f\*g} =  L{f}.L{g} where   (f\*g)(t) =  integral of  [f(u).g(t-u)]du  from 0 to t.