MAP 2302 – INTROD TO  DIFF EQUATIONS                   FLORIDA INT'L UNIV.   
Review for Test #2

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

             MAIN PROBLEM SOLVING TECHNIQUES:

1.     How to find the Wronskian W(f1,  f2,  . . .  ,  fn) of a set of functions {f1,  f2,  . . .  ,  fn}.

2.     How to check if a set of solutions of a linear homogeneous ODE is linearly independent.

3.   Reducing the order of a linear ODE by putting y = v.f(x) where f(x) = a known solution  
4.     Finding a second solution of a linear second-order ODE by putting y = v. f(x).  
5.      How to find the general solution of linear homogenous ODEs with constant coefficients  
      (a) distinct real roots  (b) distinct complex roots (c) repeated (real or complex) roots.

6.      How to find particular solutions of linear ODEs by the Undetermined Coefficient Method  
 (a) RHS is independent of complementary solution

(b) RHS is not independent of complementary solution

7.     How to find particular solutions of linear ODEs by the Variation of Parameters Method.

8. Solving the ODEs for a body attached to a linear spring:  
 (a) un-damped motion,   (b) lightly damped,  (c) critically damped (d) heavily damped.

9. Solving the ODEs for a body attached to a linear spring with an external force:

  (a) un-damped motion,   (b) lightly damped,  (c) critically damped (d) heavily damped.

              MAIN DEFINITIONS:

 A linearly dependent set of function,  A linearly independent set of functions,  The Wronskian of a set of functions,  Homogeneous and non-homogeneous linear ODEs,  Auxiliary Equation, Multiplicity of a root of the auxiliary equation, Complementary solution, Particular solution, Hooke's law for linear springs,  Critically damped systems, The Resonance phenomenon.

             MAIN THEOREMS:

1.    Linear independence of n solutions of an n-th order linear homogenous ODE when

      W(f1,  f2,  . . .  ,  fn)  is non-zero in an interval [a,b]  (Theorem 4.4).

2.     Reduction of order theorem for lin. ODEs when one non-trivial solution is given (Thm. 4.6)

3.    Second-order case of  #2 with f(x) being a known non-trivial solution)  (Theorem 4.7)

       y(x) = c1. f(x) + c2 .v(x). f(x)  where v(x) = [ {f(x)}-2 . e - {a1(x) / a0(x) }. dx] . dx   
4.      The D-Method for solving linear homogeneous ODEs with constant coefficients  
       (a) distinct real roots  (b) distinct complex roots (c) repeated (real or complex) roots.

5.      Finding a particular solution yp of linear ODEs by the Undetermined Coefficient Method  
 (a) RHS is independent of complementary solution

(b) RHS is not independent of complementary solution

6.     Variation of Parameters Method for finding a particular solution from two independent

complementary solutions y1 and y2 .  
yp =  v1. y1 + v2 .y2 where F(x) = RHS and  v1 & v2 are obtained by solving the ODEs  
      (v1)*'*  =  - {F(x).y2} / [a0(x).W(y1,y2)]     and    (v2)*'*  =  {F(x).y1} / [a0(x).W(y1,y2)] .