1. For u’’+ µ^2\*u = 0 :

u(t) = c\*sin(µt) is a solution, c a constant

u(t) = c \* cos(µt) is a solution

u(t) = cos(µ\*(t-t0)) is also a solution

u(t) = c1\*sin (µt) + c2\* cos(µt) is our general solution

2. An nth order ODE has n linearly independent (not a multiple of each other) solutions u1(t), u2(t), u3(t),…,un(t). The general solution for this nth order ODE is a superposition of all the linearly independent solutions: u(t) = c1\*u1(t) + c2\*u2(t) + c3\*u3(t) + … + cn\*un(t), each ci an arbitrary constant.

3. Linear and homogeneous ODE definition: For u(x), the ODE of the form Au + Bu’+Cu’’+..=Z, where “ ‘ = d/dx”, is linear if A,B,C,…Z, are constants or parameters or functions of the independent variable x. All other forms of ODE are nonlinear. If Z = 0, the linear ODE is homogeneous.

4. The better guess for any linear, homogeneous, constant coefficient ODE is u(x) = .

5. Principle of Superposition for an ODE (thm): For a linear, homogeneous ODE, if u1(x) satisfies the ODE, and u2(x) satisfies the ODE, then: a\*u1(x), u1(x) +u2(x) are also solutions. The general solution of a linear, homogeneous ODE of order N is: c1\*u1(x) + c2\*u2(x) +…+cN\*uN(x), where u1,u2,…uN are linearly independent (not a multiple of each other).

6. For u’’-µ^2u=0 we have more solutions:

7. Principle of superposition for an PDE: If we have a linear, homogeneous PDE with solutions u1 and u2 then au1 is a solution and a\*u1+b\*u2 is a solution. This also holds for homogeneous BC and IC. If f(x) and g(x) satisfy f(x\*) = 0 and g(x\*)=0 for a particular point x\*, then a\*f(x\*)+b\*g(x\*)=0. (All of this statement also holds for multivariable case).