Elementary Differential Equations-Math 240
Exam 2–Summer 2005
July 1,2005

Name:

Instructor:

Please show all work.Answers with no work will receive non credit.No calculatrs or notes are allowed on this exam

The formula for Variation of Parameters is:

$$y_p = -y_1(x)\int \frac{y_2(t)g(t)}{W(y_1, y_2)(t)}dt + y_2(x)\int \frac{y_1(t)g(t)}{W(y_1, y_2)(t)}dt$$

1. (10 pts) Solve the following differential equation:

$$y''' - 8y'' + 16y' = 0$$

2. (15 pts) Solve the following Boundary Value Problem:

$$y'' + 10y' + 26y = 0 \quad y(0) = 0, y(\frac{\pi}{2}) = 1$$

3. (10 pts) Convert $-\frac{7}{2}cos(5x) + \frac{7\sqrt{3}}{2}sin(5x)$ to $Acos(\omega x + \theta))$

4. (15 pts) Solve the following Initial Value Problem

$$y'' + 3y' + 2y = e^{-2x} \quad y(0) = 1, y'(0) = -1$$

5. (15 pts) Solve the following differential equation(**Simplify your answer completely**)

$$y'' + 4y' + 3y = e^{-4x}(x^2 + 2)$$

6. (15 pts) Assuming that $u(x,t) = X(x)T(t)$,solve the partial differential equation

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} - 4u$$

7. A mass of $4kg$ is attached to spring which causes the spring to stretch $4.9m$.The spring has a damping constant of $10kg/sec$ and is under an external force of $15sint$ newtons.(Hint:$g = 9.8m/sec^2$)

   (a) (15 pts) Find the differential equation of the resulting motion and solve it.

   (b) (5 pts) Find the steady state solution of the equation.