

020 ~~20/03~~ File # 805  
10/28/03

Diff Eq - 3450:335  
EXAM #2 Spr 00

NAME \_\_\_\_\_  
ROW \_\_\_\_\_

100 Points

Show ALL your work.

1. Find the general solution to  $\frac{d^3y}{dx^3} - \frac{d^2y}{dx^2} = -18x + 12e^{2x}$ .

16 Points

2. Find the general solution to  $2y'' + 50y = \frac{150}{\cos(5x)}$ .

16 Points

3. One solution of the equation  $xy'' - 2(1+x)y' + (x+2)y = 0$  is  $y = e^x$ .  
Find the general solution to this differential equation.

16 Points

32 Points

4. A solution to  $x^2y'' - xy' + y = 2x$  is  $y = x(\ln x)^2$ . A solution to  $x^2y'' - xy' + y = x^3$  is  $y = \frac{1}{4}x^3$ . Find the general solution to  $x^2y'' - xy' + y = 8x^3 - 6x$ .

16 Points

5. Solve the system of equations:  $\frac{dx}{dt} = 3x + 4y$   
 $\frac{dy}{dt} = 6x + 5y$ .

16 Points

32 Points

6. A 12 lb weight is attached to a spring hanging from the ceiling. This causes the spring to stretch 2 ft on coming to rest at equilibrium. There is no damping in this system.

Initially the weight is released 1 ft below the equilibrium position with an upward velocity of 4 ft/sec.

6a. Write down the governing differential equation and initial conditions for the motion of the weight. DO NOT SOLVE THE EQUATION.

6 Points

6b. The answer to the above differential equation is  $x(t) = c_1\cos(4t) + c_2\sin(4t)$ . Find  $c_1$  and  $c_2$ .

2 Points

6c. Find the amplitude, period, and phase angle of the motion.

6 Points

6d. At what times does the weight return to the point 1 ft below the equilibrium position?

6 Points

20 Points