

File # 805-

Diff Eq - 3450:335  
Exam #1 Fall01

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

100 Points

Show ALL your work.

1. Solve  $(6x^{1/2}y^{1/2} - 1) dy = -x^{-1/2}(2y^{3/2} + 1) dx$ .

15 Points

2a. You are given the differential equation  $\frac{dy}{dt} + ky = 5$ , where  $k > 0$  is a constant. Show that  $y = Ce^{-kt} + \frac{5}{k}$  is a solution to the above for any constant  $C$ .

5 Points

2b. Find  $C$  and  $k$  if  $y(0) = 15$  and  $\lim_{t \rightarrow \infty} y(t) = 10$ .

6 Points

26 Points

$$\frac{dy}{dx} = -(3x - 7y)^2 + 40 \text{ by making the substitution } z = 3x - 7y.$$

15 Points

$$\frac{y}{t} + \frac{t+1}{2}y = (t+1)y^{-1}.$$

15 Points

30 Points

5. Solve  $(2x^2 + 2xy - 3y^2) dx + (2xy - x^2) dy = 0$ .

15 Points

- 6a. A car has a mass of 2000 kg and a braking system that provides a deceleration that is proportional to the square of the instantaneous velocity,  $V(t)$ , of the car. The brakes are applied when the car is traveling  $25 \frac{\text{m}}{\text{s}}$ . It is observed that the car stops in 5 seconds. SET UP BUT DO NOT SOLVE differential equation(s) and condition(s) to determine the car's velocity at any time  $t$ .

8 Points

- 6b. SET UP BUT DO NOT SOLVE the equations you would use to find how far the car traveled.

6 Points
29 Points