Name: _____

4-digit code: _____

- Write your name and the last 4 digits of your SSN in the space provided above.
- The test has four (4) pages, including this one.
- Show sufficient work to justify all answers unless otherwise stated in the problem. Correct answers with inconsistent work may not be given credit.
- Credit for each problem is given at the right of each problem number.
- No books, notes or calculators may be used on this test.

Page	**Max**	**Points**
2	35	
3	40	
4	25	
Total	100	

Problem 1 (10 pts)**.** Write a differential equation of the form $y' = f(x, y)$ having as solution a function g that satisfies that the slope of the graph of g at the point (x, y) is twice the sum of x and y.

Problem 2 (10 pts)**.** Solve the initial value problem

$$9\frac{dy}{dx} = \frac{1}{\sqrt{3x+4}} \qquad y(7) = -1$$

Problem 3 (15 pts)**.** Find an **explicit** general solution of the differential equation

$$yy' = x(y^2 + 1)$$

Indicate at least one singular solution of this equation.

Problem 4 (20 pts)**.** Find a general solution of the second-order differential equation $y'' + y' = e^{-x}$.

Problem 5 (20 pts)**.** Find a general solution of the differential equation

$$\left(x^3 + \tfrac{y}{x}\right) + (y^2 + \ln x)y' = 0$$

Problem 6 (25 pts)**.** Find a general solution of the differential equation $x^2y' + 2xy = 5y^4$.