Math 334 A1 Homework 1 (Due Sep. 24 5pm)

Sep. 17, 2010

- No "Advanced" or "Challenge" problems will appear in homeworks.

Basic Problems

Problem 1. (2.1 13) Solve

$$y' - y = 2\,t\,e^{2t}, \qquad y(0) = 1. \tag{1}$$

Problem 2. (2.1 15) Solve

$$t\,y' + 2\,y = t^2 - t + 1, \qquad y(1) = \frac{1}{2}, \qquad t > 0. \tag{2}$$

Problem 3. (2.2 5) Solve

$$y' = \left(\cos^2 x\right)\left(\cos^2 2\,y\right). \tag{3}$$

Problem 4. (2.4 25) Let $y = y_1(t)$ be a solution of

$$y' + p(t)\,y = 0, \tag{4}$$

and let $y = y_2(t)$ be a solution of

$$y' + p(t)\,y = g(t). \tag{5}$$

Show that $y = y_1(t) + y_2(t)$ is also a solution of

$$y' + p(t)\,y = g(t). \tag{6}$$

Problem 5. (2.6 3) Is the following equation exact? If it is, solve it.

$$\left(3\,x^2 - 2\,x\,y + 2\right)\mathrm{d}x + \left(6\,y^2 - x^2 + 3\right)\mathrm{d}y = 0. \tag{7}$$

Problem 6. (2.6 15) Find the value b for which the equation is exact, and then solve it using that value of b.

$$\left(x\,y^2 + b\,x^2\,y\right)\mathrm{d}x + (x + y)\,x^2\,\mathrm{d}y = 0. \tag{8}$$

Intermediate Problems

Problem 7. (2.6 25) Find an integrating factor and solve the equation.

$$\left(3\,x^2\,y + 2\,x\,y + y^3\right)\mathrm{d}x + \left(x^2 + y^2\right)\mathrm{d}y = 0. \tag{9}$$

Problem 8. (2.6 27) Find an integrating factor and solve

$$\mathrm{d}x + (x/y - \sin y)\,\mathrm{d}y = 0. \tag{10}$$