

A few extra Math 4100 problems: Solve the ODE's and the IVP's.

1. $2\dot{u} + 6u = t, \quad u(0) = 1.$
2. $xdy/dx - y = 1, \quad x > 0.$
3. $\sin x \sin y dy/dx = \cos x \cos y + 2x.$
4. $z^2 d^2y/dz^2 - z dy/dz - 3y = 0, z > 0.$ Hint: Look for a solution of the form $y = z^r.$
5. $x'' + 3x' + x = 0.$
6. $y'' + y' - 2y = 0, \quad y(0) = 1, \quad y'(0) = 1.$
7. $(x + 2) \sin y + x \cos y dy/dx = 0.$
8. Find the general solution of the ODE

$$t^2\ddot{u} - t\dot{u} + u = 0.$$

Hint: $u = t$ is a solution.

9. Do the functions $y_1(x) = \sin x$ and $y_2(x) = 2 \cos(\pi/2 - x)$ form a fundamental set of solutions for the ODE $y'' + y = 0$? Explain your answer.
10. Find the monthly payment on a \$50,000 loan at 5% annual interest compounded continuously that is to be paid back after 10 years.