Final Exam Review
MAP 2302 – Ordinary Differential Equations I
December 8, 2015

1. Solve the initial value problem:

$$(xy + y^2)\,dx - x^2\,dy = 0, \qquad y(1) = -1/5, \qquad x \neq 0$$

2. Find the general solution:

$$y' - \frac{\tan(t)}{2}y = -\frac{\sec^2(t)}{2}y^3, \qquad t > 0$$

3. Solve the initial value problem:

$$(3x^2 + 6xy + 3y^2)\left(1 + \frac{dy}{dx}\right) = 0, \qquad y(0) = 3$$

4. Find the general solution to

$$y'' - y' - 2y = e^{-t}$$

   (a) by the method of undetermined coefficients and
   (b) by variation of parameters.

5. Find a power series solution expanded about the point x_0:

$$y'' + k^2(x^2 - 4x + 4)y = 0, \qquad x_0 = 2$$

6. Use reduction of order to find a second solution if x^r is a solution of

$$x^2y'' + \alpha xy' + \beta y = 0, \qquad x > 0$$

7. Solve the initial value problem using the Laplace transform:

$$y'' + 3y' + 2y = \cos(\alpha t), \qquad y(0) = 1, \qquad y'(0) = 0$$