

McGill University  
Math 315A: Differential Equations  
Assignment 5: due Tuesday, November 11, 2003 before 5pm

1. (2 pts) Given a differential equation and a nontrivial solution  $y_1$ , use the method of reduction of order to find another solution  $y_2$ :

a)  $xy'' + (1 - 2x)y' + (x - 1)y = 0$ ,  $x > 0$ ,  $y_1(x) = e^x$ ;

b)  $x^2y'' + 6xy' + 6y = 0$ ,  $x > 0$ ,  $y_1(x) = x^{-2}$ .

2. Find the general solution of the following differential equation:

$$x^2y'' + 4xy' + 2y = x^3 + \ln x.$$

3. (2 pts) Find general solutions of the following equations:

a)  $y'' + 9y = \sec^2(3x)$  (variation of parameters);

b)  $x^2y'' + 3xy' + y = 1/x$  (Cauchy-Euler).

4. Find a general solution of the non-homogeneous equation

$$xy'' + (1 - 2x)y' + (x - 1)y = xe^x$$

using the two solutions  $y_1, y_2$  of the homogeneous equation you found in Problem 1a.