

## Higher Order Linear Differential Equations- HW Problems

1. Show that  $f(x) = x$ ,  $g(x) = x^2 - 2x$ , and  $h(x) = 8x - 2x^2$  are linearly dependent by finding real numbers  $c_1, c_2$ , and  $c_3$  such that  $c_1f(x) + c_2g(x) + c_3h(x) = 0$  for all  $x$ .
2. Use the Wronskian to show that the functions in problem number 1 are linearly dependent on  $\mathbb{R}$ .
3. Use the Wronskian to show that  $e^{2x}$ ,  $e^{4x}$ , and  $e^{6x}$  are linearly independent on  $\mathbb{R}$ .
4.  $y^{(3)} - 2y'' - 5y' + 6y = 0$  has  $y_1 = e^x$ ,  $y_2 = e^{-2x}$ , and  $y_3 = e^{3x}$  as linearly independent solutions. Find the particular solution where  $y(0) = 0$ ,  $y'(0) = -4$ , and  $y''(0) = 14$ .

In problems 5 and 6 you are given the complementary solution  $y_c$  and a particular solution  $y_p$  of a differential equation. Find the solution to the given initial value problem.

5.  $y'' + 9y = 18x$ ,  $y_c = c_1 \cos(3x) + c_2 \sin(3x)$ ,  $y_p = 2x$ ,  
 $y(0) = 3$ ,  $y'(0) = 7$ .
6.  $y'' + 4y' + 13y = 13x + 17$ ,  
 $y_c = c_1 e^{-2x} \cos(3x) + c_2 e^{-2x} \sin(3x)$ ;  $y_p = x + 1$ ,  
 $y(0) = 5$ ,  $y'(0) = -1$ .