1. Find the general solution of the differential equation
   (a) $y'' - 2y' + 4y = 0$.
   (b) $y''' + 8y = 0$.
   (c) $y^{(4)} - 81y = 0$.

2. Find the general solution of the linear homogeneous differential equation with constant coefficients whose characteristic equation factors as follows.
   
   $r^3(r + 3)^2(r^2 + 9)^2(r - 5)(r^2 - 2r + 4) = 0$.

3. Suppose
   
   $y(x) = c_1 + c_2 x + (c_3 + c_4 x)e^x + (c_5 \cos(2x) + c_6 \sin(2x)) + x((c_7 \cos(2x) + c_8 \sin(2x))$ 

   is a solution to a linear homogeneous differential equation with constant coefficients. Find the differential equation.

**Suggested problems from the book (DO NOT SUBMIT):** Pg 170-172, #12, 15, 18, 29, 34, 40