13. Reduction of order (section 3.4 continued)

1. Consider second order linear homogeneous equation with arbitrary coefficients:

$$y'' + p(t)y' + q(t)y = 0.$$

   Assume that we already know one of its particular solutions, $y_1(t)$. How to find another solution to get a fundamental set?

   Step 1. Look for a second solution in the form

$$y(t) = v(t)y_1(t).$$

   Step 2. Set $v' = w$ to reduce order and solve obtained first order linear homogeneous ODE.

2. Note that the method can be also applied to linear nonhomogeneous ODE

$$y'' + p(t)y' + q(t)y = g(t).$$

3. Use the method reduction of order to find a second particular solution of

$$t^2 y'' + 2ty' - 2y = 0$$

   if $y_1(t) = t$.