# Practice Problems: Euler Equations

In each of the following problems, determine the general solution of the differential equation that is valid in any interval not containing the singular point.

1. $x^2y'' + 4xy' + 2y = 0$
2. $x^2y'' - 3xy' + 4y = 0$
3. $x^2y'' - xy' + y = 0$
4. $x^2y'' + 3xy' + 5y = 0$
5. $(x+1)^2y'' + 3(x+1)y' + 0.75y = 0$. Hint: make the substitution $t = x + 1$.
6. $(x-1)^2y'' + 8(x-1)y' + 12y = 0$

**Solutions.**

1. $y = c_1x^{-1} + c_2x^{-2}$
2. $y = c_1x^2 + c_2x^2 \ln|x|$
3. $y = c_1x + c_2x \ln|x|$
4. $y = c_1x^{-1}\cos(2\ln|x|) + c_2x^{-1}\sin(2\ln|x|)$
5. $y = c_1|x+1|^{-1/2} + c_2|x+1|^{-3/2}$
6. $y = c_1(x-1)^{-3} + c_2(x-1)^{-4}$