Reduction of Order

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- Using an equation in standard form (1), we can define $y = u(x)y_1(x)$, where $w = u'$

$$\begin{aligned} a_2(x)y'' + a_1(x)y' + a(x)y &= 0 \\ y'' + P(x)y' + Q(x)y &= 0 \\ u[y_1'' + Py_1' + Qy_1] + y_1u'' + (2y_1' + Py_1)u' &= 0 \\ y_1w' + (2y_1' + Py_1)w &= 0 \end{aligned} \tag{1}$$