1. Find the general solution to $yy'' = 1 - y$

2. Find the general solution to $yy'' = \frac{y'}{x}$

3. Find the general solution to $y'' + \frac{1}{x}y' + \frac{y^2}{x^2} = 0$.

4. Find the general solution to \( y'y''' - 2(y'')^2 + (y')^2 = 0 \).

5. Show how the solution to Blasius equation $\frac{1}{2}f''' + ff'' = 0$ can be reduced to the integration of a first-order equation following the steps indicated below.

- Using the transformation for an autonomous equation, reduce Blasius equation to the second-order ODE (subscripts below denote in each equation differentiation with respect to the independent variable)
  \[ u_{ff} + u_{f}^2 + 2fu_f = 0. \]

- Show that this equation is invariant under the group of transformations $u \rightarrow aP\; u$ and $f \rightarrow af$ with $P = 2$ and hence obtain
  \[ f^2vv_{ff} + 8fvv_f + f^2v_f^2 + 2fv_f + 6v^2 + 4v = 0. \]

- Since this is an equidimensional-in-$\;f$ equation, use $f = e^t$ to write
  \[ v(-v_t + v_{tt}) + 8vv_t + v_t^2 + 2v_t + 6v^2 + 4v = 0. \]

- Finally use the autonomous transformation again with $v_t = g(v)$ and obtain the first-order equation
  \[ vgg_v + 7vg + g^2 + 2g + 6v^2 + 4v = 0. \]