1. Solve the initial value problem

\[(x - 2)\frac{dy}{dx} = -(x - 1)y + 2(x + 1), \quad y(0) = 6.\]

2. Solve the first order linear initial value problem with discontinuous coefficient

\[\frac{dy}{dx} + P(x)y = x^{-6}, \quad y(1) = -1,\]

where \(P(x) = \begin{cases} 5/x, & 1 \leq x \leq e, \\ -1/x, & x > e. \end{cases}\)

**Hint:** Find the general solution for \(1 \leq x \leq e\). Choose the integration constant to satisfy the initial condition. Next find the general solution for \(x > e\) and choose its integration constant so that the two solutions agree at \(x = e\). Write your solution as a piecewise function

\[y = \begin{cases} y_1(x), & 1 \leq x \leq e \\ y_2(x), & x > e. \end{cases}\]

3. Solve the problem \(x\frac{dy}{dx} + 4y = -20x^4y^{3/2}(x^2 + 7)^4\).

4. Find a solution to:

\[\frac{dy}{dx} = \frac{y \cos \left(\frac{z}{y}\right)}{x \cos \left(\frac{z}{y}\right) - y}.\]