1. Solve the following initial value problem

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

An implicit solution will be enough for full credit.

2. Evaluate \(\int_{-1}^{4} g(s)ds\), where

\[g(s) = \begin{cases} 
-1, & -1 \leq s < 0 \\
 e^{\sin(s)} \cos(s), & 0 \leq s < 2 \\
 \frac{1}{\sqrt{27 - 3s^2}}, & 2 \leq s \leq 4 
\end{cases}\]

3. Find all (non-negative) values of \(p\) for which the improper integral

\[\int_{2}^{+\infty} \frac{1}{x(\ln x)^p} dx\]

converges.