(1) Evaluate the following integrals
(a) \[ \int \frac{dx}{\sin x} \]
(b) \[ \int \frac{dx}{x\sqrt{4x^2 + 1}} \]
(c) \[ \int \frac{dx}{x^3 + 1} \]
(d) \[ \int \frac{1 - x + 2x^2 - x^3}{x(x^2 + 1)^2} \, dx \]

(2) For which values of \( p \) does the integral
\[ \int_{0}^{\infty} \frac{1}{x(\ln(x))^p} \, dx \]
converge?

(3) Let \( A = \{(x, y)| x \geq 1, \frac{1}{x} \geq y \geq 0\} \). Is the area of \( A \) finite? What about the volume of the solid obtained by rotating \( A \) about the \( x \) axis?

(4) Match the following differential equations and possible solutions. (Note: The given functions may satisfy more than one equation or none, and some equations may have more than one solution.)

a. \( y'' = y \) \hspace{1cm} I. \( y = \cos x \)
b. \( y' = -y \) \hspace{1cm} II. \( y = \cos(-x) \)
c. \( y' = 1/y \) \hspace{1cm} III. \( y = x^2 \)
d. \( y'' = -y \) \hspace{1cm} IV. \( y = e^x + e^{-x} \)
e. \( x^2y'' - 2y = 0 \) \hspace{1cm} V. \( y = \sqrt{2x} \)