1. Expand the following quotient by partial fractions

\[
\frac{x^4}{x(x^4+x)(x^2-x+3)^2}
\] (DO NOT EVALUATE THE COEFFICIENTS)

2. Evaluate

\[
\int \frac{x}{(x+1)(x^2+1)} \, dx
\]

3. Solve the initial value problem

\[
\frac{dy}{dt} = \frac{\sqrt{t^2-4}}{t}, \quad t \geq 2, \quad y(2) = 0.
\]
4. Determine whether each integral converges or diverges.

(a) \( \int_{1}^{\infty} \frac{e^{-x}}{\sqrt{x}} \, dx \)  
(b) \( \int_{\pi/2}^{3\pi/2} \csc x \, dx \)

5. Which of the sequences \( \{a_n\} \) converge, and which diverge? Find the limit of each convergent sequence.

(a) \( a_n = \frac{n!}{5^{2n}} \)  
(b) \( a_n = \frac{1}{n} \int_{1}^{n} \frac{1}{t} \, dt \)

6. (Bonus) Evaluate \( \int \frac{1}{y - \sqrt{1-y^2}} \, dy \)