1. Evaluate the following integrals.

(a) \[ \int x^3 \sqrt{1 - 4x^2} \, dx \]

(b) \[ \int \frac{x + 11}{x^2 - 3x - 4} \, dx \]

(c) \[ \int \frac{2x^3 + 3x^2 + 6x + 8}{x^2 + 1} \, dx \]

(d) \[ \int e^{3x} \sin x \, dx \]

(e) \[ \int \cos^2 5x \, dx \]

(f) \[ \int \ln(\sqrt{x}) \, dx \]

(g) \[ \frac{\tan^4 x + 1}{\cos^2 x} \]

(h) \[ \int x^4 e^{-x} \, dx \]

2. Find the area of the region between the x-axis and the graph of \( f(x) = \frac{1}{x \sqrt{\ln x}} \) on the interval \([3, \infty)\).

3. Find a general formula for \( a_n \), the nth term of the following sequence. Does this sequence converge or diverge? Explain. If the sequence converges, be sure to find its limit.

\[ ?, ?, ?, ?, ?, ? \ldots \]

4. Prove that the sequence below is either strictly increasing or strictly decreasing.

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