1. [10.2.96a] **Helga von Koch’s snowflake curve.** Helga von Koch’s snowflake is a curve of infinite length that encloses a region of finite area. To see why this is so, suppose the curve is generated by starting with an equilateral triangle whose sides have length 1.

Find the length $L_n$ of the $n$th curve $C_n$ and show that $\lim_{n \to \infty} L_n = \infty$. 
2. [10.3.62] Consider the sequence \( \{1/n\}_{n=1}^{\infty} \). On each subinterval \((1/(n+1), 1/n)\) within the interval \([0, 1]\), erect the trapezoid with area \(a_n\) having heights \(y = 1/(n+1)\) at \(x = 1/(n+1)\) and \(y = 1/n\) at \(x = 1/n\). Find the total area \(\sum a_n\) of all the rectangles.
3. [10.9.43] Use the identity \( \sin^2 x = (1 - \cos 2x)/2 \) to obtain the Maclaurin series for \( \sin^2 x \). Then differentiate this series to obtain the Maclaurin series for \( 2 \sin x \cos x \). Check that this is the series for \( \sin 2x \).
4. [10.10.60b] Find the first three terms of the Taylor series for
\[
\sinh^{-1} x = \int_{0}^{x} \frac{dt}{\sqrt{1 + t^2}}
\]
to estimate \(\sinh^{-1} 0.25\). Give an upper bound for the magnitude of the estimation error.
5. [10.Adv.31b] **Quality Control** In one throw of two dice, the probability of getting a roll of sum 7 is \( p = \frac{1}{6} \). If you throw the dice repeatedly, the probability that a 7 will appear for the first time at the \( n \)th throw is \( q^{n-1}p \), where \( q = 1 - p = \frac{5}{6} \). The expected number of throws until a 7 first appears is \( \sum_{n=1}^{\infty} nq^{n-1}p \). Find the sum of this series.