1a. (10 pts) Find the length of the curve \( y = \cosh x = \frac{e^x + e^{-x}}{2} \) from \( x = 0 \) to \( x = 1 \). Hint: Recall \( y' = \sinh x = \frac{e^x - e^{-x}}{2} \) and \( 1 + \sinh^2 x = \cosh^2 x \).

b. (10 pts) Find the surface area of the surface of revolution obtained by revolving \( y = \cosh x \) about the x axis from \( x = 0 \) to \( x = 1 \).

2. Let \( p(x) = cx^{-3} \) on \([1, \infty)\).
   a. (10 pts) Choose \( c \) so that \( p(x) \) is a probability distribution.
   b. (10 pts) Find the mean of the distribution.
   c. (10 pts) Find the median of the distribution.

3. (15 pts) Evaluate the improper integral using the definition:
   \[
   \int_{1}^{\infty} \frac{\ln x}{x^2} \, dx
   \]

4a. (7 pts) State Simpson’s rule for approximating \( \int_{a}^{b} f(x) \, dx \) with \( n \) partitions of equal size.
   b. (8 pts) Use Simpson’s rule with \( n = 6 \) to approximate \( \int_{0}^{\pi} \sin x \, dx \).

5. (10 pts) Suppose that troubled S&L’s are failing at the rate of 5% per year. What is the probability that a randomly selected S&L will last more than 40 years?

6. (10 pts) The mean lifespan of a certain brand of tire is 30,000 miles with a standard deviation of 2000 miles, and is normally distributed. How many miles must a tire last to fall into the top 10% of lifespan?

\[
\begin{array}{|c|c|}
\hline
Z & \text{Area from 0 to Z} \\
\hline
1.25 & 0.3944 \\
1.26 & 0.3962 \\
1.27 & 0.3980 \\
1.28 & 0.3997 \\
1.29 & 0.4015 \\
1.30 & 0.4032 \\
\hline
\end{array}
\]