1. Evaluate the following:

   (a) \( \frac{d}{dx} \int_5^{x^2+e^x} \sin^2(x) \, dx \).

   (b) \( \int \tan(x) \, dx \).

   (c) \( \int_0^3 |2x - 3| \, dx \).

   (d) \( \int_0^{\pi/4} \frac{1 - \sin^2(\theta)}{\cos^2(\theta)} \, d\theta \).

2. A solid is formed by adjoining two hemispheres to the ends of a right circular cylinder. Find the dimensions that minimize the cost if the volume must be 300 ft\(^3\) and the hemispherical ends cost twice as much per square foot of surface area as the sides.

3. Consider the sum:

   \[ \sum_{k=1}^{n} (k - 2)^2. \]

   (a) Find the value of the sum when \( n = 4 \) by computing each term.
(b) Find the value of the sum when \( n = 50 \) by using the summation formulas you were given in class.

4. Find the value of \( f(c) \) guaranteed by the Mean Value Theorem for Integrals in the following problem:

\[
\int_1^9 \frac{1}{\sqrt{x}(1 + \sqrt{x})^2} \, dx.
\]

5. Find the volume of the solid generated by revolving the region bounded by \( y = x^2 \) and \( y = 4x - x^2 \) about the line \( y = 6 \).

6. Find the left-hand, right-hand, and midpoint sums for the function \( y = (x - 3)^2 \) on the interval \([1, 3]\) using four equally spaced intervals. What are you approximating, and which of the three is a better estimate for this?
7. Find the total area between the curve $y = \cos^2(2t)$ and the x-axis on the interval $[-\pi/2, \pi]$. 