First Assignment
Due Tuesday, February 3, 2004

Prepare a clear Mathematica notebook, labelled with your name, the assignment number, and clear explanations of the computations you are doing. Hand in a printed copy, and also attach an electronic copy in an email to rbk@louisiana.edu.

Consider the function

\[ f(x) = \frac{e^{-x^2} \sin^2(x)}{x}. \]

1. Compute a Taylor representation with terms of degree 8, centered at \( x = 0 \), for \( f \).

2. Estimate

\[ \int_{-\pi}^{\pi} f(x)dx \]  

by integrating the Taylor polynomial, and obtaining a numerical approximation.

3. Compare the value you obtain to the value Mathematica gives with numerical integration. (You can compare by looking at the difference of the two values, then dividing the difference by the maximum of the absolute values of the two values. This reveals the number of significant figures to which the values agree.) What have you discovered?

4. Do the same as in part 3, except for the integral

\[ \int_{1}^{\infty} f(x)dx. \]  

5. What can you conclude from this entire problem?