## 8.7 LABORATORY PROJECT: CAS AN ELUSIVE LIMIT

This project can be completed anytime after you have studied Section 8.7 in the textbook. This project deals with the function

 $f(x) = \frac{\sin(\tan x) - \tan(\sin x)}{\arcsin(\arctan x) - \arctan(\arcsin x)}$ 

- I. Use your computer algebra system to evaluate f(x) for x = 1, 0.1, 0.01, 0.001, and 0.0001. Does it appear that f has a limit as  $x \rightarrow 0$ ?
- **2.** Use the CAS to graph f near x = 0. Does it appear that f has a limit as  $x \rightarrow 0$ ?
- 3. Try to evaluate  $\lim_{x\to 0} f(x)$  with l'Hospital's Rule, using the CAS to find derivatives of the numerator and denominator. What do you discover? How many applications of l'Hospital's Rule are required?
- **4.** Evaluate  $\lim_{x\to 0} f(x)$  by using the CAS to find sufficiently many terms in the Taylor series of the numerator and denominator. (Use the command taylor in Maple or Series in Mathematica.)
- 5. Use the limit command on your CAS to find  $\lim_{x\to 0} f(x)$  directly. (Most computer algebra systems use the method of Problem 4 to compute limits.)
- **6.** In view of the answers to Problems 4 and 5, how do you explain the results of Problems 1 and 2?