Chapter 8   Questions to Guide Your Review

1. What basic integration formulas do you know?

2. What procedures do you know for matching integrals to basic formulas?

3. What is the formula for integration by parts? Where does it come from? Why might you want to use it?

4. When applying the formula for integration by parts, how do you choose the u and dv? How can you apply integration by parts to an integral of the form $\int f(x)\,dx$?

5. What is tabular integration? Give an example.

6. What is the goal of the method of partial fractions?

7. When the degree of a polynomial $f(x)$ is less than the degree of a polynomial $g(x)$, how do you write $f(x)/g(x)$ as a sum of partial fractions if $g(x)$

   a. is a product of distinct linear factors?

   b. consists of a repeated linear factor?

   c. contains an irreducible quadratic factor?

   What do you do if the degree of f is *not* less than the degree of g?

8. If an integrand is a product of the form $\sin^n x \cos^m x$, where m and n are nonnegative integers, how do you evaluate the integral? Give a specific example of each case.

9. What substitutions are made to evaluate integrals of $\sin mx \sin nx$, $\sin mx \cos nx$, and $\cos mx \cos nx$? Give an example of each case.

10. What substitutions are sometimes used to transform integrals involving $\sqrt{a^2 - x^2}$, $\sqrt{a^2 + x^2}$, and $\sqrt{x^2 - a^2}$ into integrals that can be evaluated directly? Give an example of each case.

11. What restrictions can you place on the variables involved in the three basic trigonometric substitutions to make sure the substitutions are reversible (have inverses)?

12. How are integral tables typically used? What do you do if a particular integral you want to evaluate is not listed in the table?

13. What is a reduction formula? How are reduction formulas typically derived? How are reduction formulas used? Give an example.

14. You are collaborating to produce a short "how-to" manual for numerical integration, and you are writing about the Trapezoidal Rule. **(a)** What would you say about the rule itself and how to use it? How to achieve accuracy? **(b)** What would you say if you were writing about Simpson's Rule instead?

15. How would you compare the relative merits of Simpson's Rule and the Trapezoidal Rule?

16. What is an improper integral of Type I? Type II? How are the values of various types of improper integrals defined? Give examples.

17. What tests are available for determining the convergence and divergence of improper integrals that cannot be evaluated directly? Give examples of their use.