**Chapter 3**

**Techniques of Integration**

**3.1 Integration by Parts**

**Section Exercises**

**In using the technique of integration by parts, you must carefully choose which expression is *u.* For each of the following problems, use the guidelines in this section to choose *u.* Do not evaluate the integrals.**

1. 

Answer: 

3. 

Answer: 

5. 

Answer: 

**Find the integral by using the simplest method. Not all problems require integration by parts.**

7.  (*Hint:*  is equivalent to )

Answer: 

9. 

Answer: 

11. 

Answer: 

13. 

Answer: 

15. 

Answer: 

17. 

Answer: 

19. 

Answer: 

21. 

Answer: 

23. 

Answer: 

25. 

Answer: 

27. 

Answer: 

29. 

Answer: 

31. 

Answer: 

33. 

Answer: 

35. 

Answer: 

37. 

Answer: 

**Compute the definite integrals. Use a graphing utility to confirm your answers.**

39. (Express the answer in exact form.)

Answer: 

41. 

Answer: 2

43.  (Express the answer in exact form.)

Answer: 

45.  (Express the answer in exact form.)

Answer: 

47. Evaluate 

Answer: 

**Derive the following formulas using the technique of integration by parts. Assume that *n* is a positive integer. These formulas are called *reduction formulas* because the exponent in the *x* term has been reduced by one in each case. The second integral is simpler than the original integral.**

49. 

Answer: Answers vary

51. Integrate  using two methods:

1. Using parts, letting 
2. Substitution, letting 

Answer: a.  b. 

**State whether you would use integration by parts to evaluate the integral. If so, identify *u* and *dv*. If not, describe the technique used to perform the integration without actually doing the problem.**

53. 

Answer: Do not use integration by parts. Choose *u* to be and the integral is of the form 

55. 

Answer: Do not use integration by parts. Let  and the integral can be put into the form 

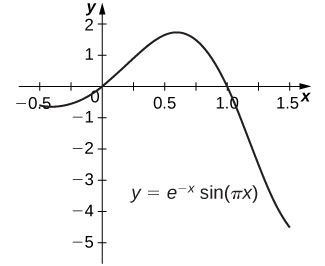
57. 

Answer: Do not use integration by parts. Choose *u* to be  and the integral can be put into the form 

**Sketch the region bounded above by the curve, the *x*-axis, and  and find the area of the region. Provide the exact form or round answers to the number of places indicated.**

59.  (Approximate answer to five decimal places.)

Answer: The area under graph is 0.39535.



**Find the volume generated by rotating the region bounded by the given curves about the specified line. Express the answers in exact form or approximate to the number of decimal places indicated.**

61.   about  (Express the answer in exact form.)

Answer: 

63. Find the area under the graph of  from  (Round the answer to two significant digits.)

Answer: 2.05

65. Find the area of the region enclosed by the curve  and the *x*-axis for  (Express the answer in exact form.)

Answer: 

67. Find the volume of the solid generated by revolving the region bounded by the curve  and the *x*-axis,  about the *x*-axis. (Express the answer in exact form.)

Answer: 

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