4E Exercises

Integrate by Substitution

Find the indefinite integral and check by differentiation

11. $\displaystyle \int (1 + 6x)^4(6)\ dx$

15. $\displaystyle \int x^3(x^4 + 3)^2\ dx$

19. $\displaystyle \int t\sqrt{t^2 + 2}\ dt$

23. $\displaystyle \int \frac{x}{(1 - x^2)^3}\ dx$

49. $\displaystyle\int \sin 4x \, dx$

53. $\displaystyle\int \sin 2x \cos 2x \, dx$

55. $\displaystyle\int \tan^4 x \sec^2 x \, dx$

Find an equation for the function f that has the given derivative and whose graph passes through the given point

63. $f'(x) = 2 \sin 4x$

$\left(\dfrac{\pi}{4}, -\dfrac{1}{2}\right)$

Evaluate the definite integral and check with your graphing utility.

75. $\int_{-1}^{1} x(x^2 + 1)^3 \, dx$

77. $\int_{1}^{2} 2x^2 \sqrt{x^3 + 1} \, dx$

81. $\int_{1}^{9} \frac{1}{\sqrt{x}\left(1 + \sqrt{x}\right)^2} \, dx$

119. Water Supply A model for the flow rate of water at a pumping station on a given day is

$$R(t) = 53 + 7 \sin\left(\frac{\pi t}{6} + 3.6\right) + 9 \cos\left(\frac{\pi t}{12} + 8.9\right)$$

where $0 \le t \le 24$. R is the flow rate in thousands of gallons per hour, and t is the time in hours.

(a) Use a graphing utility to graph the rate function and approximate the maximum flow rate at the pumping station.

(b) Approximate the total volume of water pumped in 1 day.

122. The probability that ore samples taken from a region contain between $100a\%$ and $100b\%$ iron is

$$P_{a,\,b} = \int_a^b \frac{1155}{32} x^3 (1 - x)^{3/2}\, dx$$

where x represents the proportion of iron. (See figure.) What is the probability that a sample will contain between

(a) 0% and 25% iron?

(b) 50% and 100% iron?