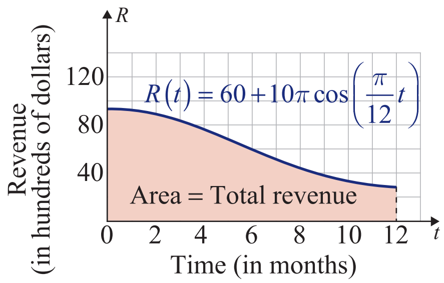

Solution

The total estimated revenue is the area under the curve as shown in the figure. This area is the value of the following definite integral.

$$\int_0^{12}\left[60+10\pi\cos\left(\frac{\pi}{12}t\right)\right]dt = 60t+10\pi\cdot\frac{12}{\pi}\cdot\sin\left(\frac{\pi}{12}t\right)\Bigg]_0^{12}$$
$$=\left[60(12)+120\sin(\pi)\right]-0$$
$$=720$$

The total estimated revenue from the ski section for one year is \$72,000.

9.3 EXERCISES

PRACTICE

In Exercises 1–30, evaluate the given integral.

1. $\int \cos(4x)\,dx$

2. $\int \sin\left(\frac{1}{3}x\right)dx$

3. $\int \sec^2(4x)\,dx$

4. $\int \tan(\pi x)\,dx$

5. $\int \tan(7x+1)\,dx$

6. $\int \sec^2(2x+5)\,dx$

7. $\int x\sin(x^2)\,dx$

8. $\int x^2\cos(x^3)\,dx$

9. $\int_0^{\frac{\pi}{3}} \sin(2x)\,dx$

10. $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \cos(3x)\,dx$

11. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} (\cos x+\sin x)\,dx$

12. $\int_0^{\frac{\pi}{4}} 2\sin(\pi-x)\,dx$

13. $\int_0^{\frac{\pi}{6}} \cos x\sin x\,dx$

14. $\int_0^{\frac{\pi}{4}} \sec^2 x\tan x\,dx$

15. $\int e^x\cos(e^x)\,dx$

16. $\int e^x\sec^2(e^x)\,dx$

17. $\int (\sin x)e^{\cos x}\,dx$

18. $\int (\cos x)e^{\sin x}\,dx$

19. $\int \frac{\tan\sqrt{x}}{\sqrt{x}}\,dx$

20. $\int \frac{\sin\sqrt{x}}{\sqrt{x}}\,dx$

21. $\int \frac{\sin(\ln x)}{x}\,dx$

22. $\int \frac{\cos(\ln x)}{x}\,dx$

23. $\int_0^{\frac{\pi}{6}} \frac{\cos x}{1+\sin x}\,dx$

24. $\int_{\frac{\pi}{4}}^{\frac{\pi}{3}} \frac{\sin(2x)}{1-\cos(2x)}\,dx$

25. $\int_{\frac{\pi}{3}}^{\frac{\pi}{2}} \frac{\sin(3x)}{(1-\cos(3x))^2}\,dx$

26. $\int_0^{\frac{\pi}{2}} \sqrt{1+\sin x}\cos x\,dx$

27. $\int \cot x\,dx$ (**Hint:** $\cot x = \frac{\cos x}{\sin x}$)

28. $\int \tan^2 x\,dx$ (**Hint:** $\tan^2 x = \sec^2 x - 1$)

29. $\int \sin^2 x\,dx$ (**Hint:** $\sin^2 x = \frac{1}{2}(1-\cos(2x))$)

30. $\int \cos^2 x\,dx$ (**Hint:** $\cos^2 x = \frac{1}{2}(1+\cos(2x))$)

In Exercises 31–34, integrate by parts.

31. $\int x\cos(2x)\,dx$

32. $\int x\sin(5x)\,dx$

33. $\int x\sec^2 x\,dx$

34. $\int 3x\sec^2(2x)\,dx$

35. Find the area of the region bounded by the x-axis and $y = 3\sin\frac{x}{2}$ on the interval $[0, \pi]$.

36. Find the area of the region bounded by the x-axis and $y = 5\cos\frac{x}{3}$ on the interval $\left[0, \frac{\pi}{2}\right]$.

37. Find the area of the region bounded by $y = 2\cos x$ and $y = \sin(2x)$ on the interval $\left[0, \frac{\pi}{4}\right]$.

38. Find the area of the region bounded by $y = \sin x$ and $y = \tan x$ on the interval $\left[\frac{\pi}{4}, \frac{\pi}{3}\right]$.

39. Find the volume of the solid generated when the region bounded by the graph of $y = 2\sin x$, $x = 0$, and $x = \pi$ is rotated about the x-axis. (See Section 7.6.)

APPLICATIONS

40. Profit: Wes operates a boat-rental concession at a fishing resort from mid-April to mid-September. His marginal profit is approximately $P'(t) = \frac{200\pi}{3}\sin\left(\frac{\pi}{12}(t+4)\right)$ dollars per week, where t is the number of weeks after mid-April and $0 \le t \le 20$. Find the weekly profit function P, if $P(0) = \$1300$.

41. Average population: The population of a farming community during harvest season is estimated by $P(t) = 2600 + 180\sin\left(\frac{\pi}{12}t\right)$, where t is the number of weeks after the start of harvest and $0 \le t \le 12$. Find the average weekly population of the community from $t = 4$ to $t = 8$. (See Section 6.4.)