

Choose the correct answer in Exercises 21 and 22.

21. The anti-derivative of  $\left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)$  equals

### EXERCISE 7.1

Find an anti-derivative (or integral) of the following functions by the method of inspection.

1.  $\sin 2x$

3.  $e^{2x}$

4.  $(ax + b)^2$

2.  $\cos 3x$

5.  $\sin 2x - 4e^{3x}$

Find the following integrals in Exercises 6 to 20:

6.  $\int (4e^{3x} + 1) dx$

9.  $\int (2x^2 + e^x) dx$

12.  $\int \frac{x^3 + 3x + 4}{\sqrt{x}} dx$

7.  $\int x^2 \left(1 - \frac{1}{x^2}\right) dx$

10.  $\int \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 dx$

13.  $\int \frac{x^3 - x^2 + x - 1}{x - 1} dx$

8.  $\int (ax^2 + bx + c) dx$

11.  $\int \frac{x^3 + 5x^2 - 4}{x^2} dx$

14.  $\int (1 - x)\sqrt{x} dx$

15.  $\int \sqrt{x}(3x^2 + 2x + 3) dx$

19.  $\int \frac{\sec^2 x}{\csc^2 x} dx$

16.  $\int (2x - 3 \cos x + e^x) dx$

17.  $\int (2x^2 - 3 \sin x + 5\sqrt{x}) dx$

18.  $\int \sec x (\sec x + \tan x) dx$

20.  $\int \frac{2 - 3 \sin x}{\cos^2 x} dx$

Choose the correct answer in Exercises 21 and 22.

21. The anti-derivative of  $\left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)$  equals

(A)  $\frac{1}{3}x^{3/2} + 2x^{1/2} + C$  (B)  $\frac{2}{3}x^{3/2} + \frac{1}{2}x^{1/2} + C$   
 (C)  $\frac{2}{3}x^{3/2} + 2x^{1/2} + C$  (D)  $\frac{3}{2}x^{3/2} + \frac{1}{2}x^{1/2} + C$

22. If  $\frac{d}{dx}f(x) = 4x^3 - \frac{3}{x^4}$  such that  $f(2) = 0$ , then  $f(x)$  is

(A)  $x^4 + \frac{1}{x^3} - \frac{129}{8}$  (B)  $x^3 + \frac{1}{x^4} + \frac{129}{8}$   
 (C)  $x^4 + \frac{1}{x^3} + \frac{129}{8}$  (D)  $x^3 + \frac{1}{x^4} - \frac{129}{8}$

### EXERCISE 7.3

Find the integrals of the functions in Exercises 1 to 22:

1.  $\sin^2(2x + 5)$

4.  $\sin^3(2x + 1)$

7.  $\sin 4x \sin 8x$

2.  $\sin 3x \cos 4x$

5.  $\sin^3 x \cos^3 x$

8.  $\frac{1 - \cos x}{1 + \cos x}$

3.  $\cos 2x \cos 4x \cos 6x$

6.  $\sin x \sin 2x \sin 3x$

9.  $\frac{\cos x}{1 + \cos x}$

10.  $\sin^4 x$

11.  $\cos^4 2x$

12.  $\frac{\sin^2 x}{1 + \cos x}$

13.  $\frac{\cos 2x - \cos 2\alpha}{\cos x - \cos \alpha}$

14.  $\frac{\cos x - \sin x}{1 + \sin 2x}$

15.  $\tan^3 2x \sec 2x$

16.  $\tan^4 x$

17.  $\frac{\sin^3 x + \cos^3 x}{\sin^2 x \cos^2 x}$

18.  $\frac{\cos 2x + 2 \sin^2 x}{\cos^2 x}$

19.  $\frac{1}{\sin x \cos^3 x}$

20.  $\frac{\cos 2x}{(\cos x + \sin x)^2}$

21.  $\sin^{-1}(\cos x)$

22.  $\frac{1}{\cos(x-a) \cos(x-b)}$

Choose the correct answer in Exercises 23 and 24.

23.  $\int \frac{\sin^2 x - \cos^2 x}{\sin^2 x \cos^2 x} dx$  is equal to

(A)  $\tan x + \cot x + C$  (B)  $\tan x + \csc x + C$  (C)  $-\tan x + \cot x + C$  (D)  $\tan x + \sec x + C$

24.  $\int \frac{e^x(1+x)}{\cos^2(e^x)} dx$  equals

(A)  $-\cot(e^x) + C$  (B)  $\tan(xe^x) + C$  (C)  $\tan(e^x) + C$  (D)  $\cot(e^x) + C$

### EXERCISE 7.4

Integrate the functions in Exercises 1 to 23:

1.  $\frac{3x^2}{x^6 + 1}$

9.  $\frac{\sec^2 x}{\sqrt{\tan^2 x + 4}}$

17.  $\frac{x+2}{\sqrt{x^2-1}}$

2.  $\frac{1}{\sqrt{1+4x^2}}$

10.  $\frac{1}{\sqrt{x^2+2x+2}}$

18.  $\frac{5x-2}{1+2x+3x^2}$

3.  $\frac{1}{\sqrt{(2-x)^2+1}}$

11.  $\frac{1}{9x^2+6x+5}$

19.  $\frac{6x+7}{\sqrt{(x-5)(x-4)}}$

4.  $\frac{1}{\sqrt{9-25x^2}}$

12.  $\frac{1}{\sqrt{7-6x-x^2}}$

20.  $\frac{x+2}{\sqrt{4x-x^2}}$

5.  $\frac{3x}{1+2x^4}$

13.  $\frac{1}{\sqrt{(x-1)(x-2)}}$

21.  $\frac{x+2}{\sqrt{x^2+2x+3}}$

6.  $\frac{x^2}{1-x^6}$

14.  $\frac{1}{\sqrt{8+3x-x^2}}$

22.  $\frac{x+3}{x^2-2x-5}$

7.  $\frac{x-1}{\sqrt{x^2-1}}$

15.  $\frac{1}{\sqrt{(x-a)(x-b)}}$

23.  $\frac{5x+3}{\sqrt{x^2+4x+10}}$

8.  $\frac{x^2}{\sqrt{x^6+a^6}}$

16.  $\frac{4x+1}{\sqrt{2x^2+x-3}}$

Choose the correct answer in Exercises 24 and 25.

24.  $\int \frac{dx}{x^2+2x+2}$  equals

(A)  $x \tan^{-1}(x+1) + C$

(B)  $\tan^{-1}(x+1) + C$

(C)  $(x+1)\tan^{-1}x + C$

(D)  $\tan^{-1}x + C$

25.  $\int \frac{dx}{\sqrt{9x-4x^2}}$  equals

(A)  $\frac{1}{9}\sin^{-1}\left(\frac{9x-8}{8}\right) + C$

(B)  $\frac{1}{2}\sin^{-1}\left(\frac{8x-9}{9}\right) + C$

(C)  $\frac{1}{3}\sin^{-1}\left(\frac{9x-8}{8}\right) + C$

(D)  $\frac{1}{2}\sin^{-1}\left(\frac{9x-8}{9}\right) + C$

### EXERCISE 7.5

Integrate the rational functions in Exercises 1 to 21:

1.  $\frac{x}{(x+1)(x+2)}$

8.  $\frac{x}{(x-1)^2(x+2)}$

15.  $\frac{1}{x^4-1}$

2.  $\frac{1}{x^2-9}$

9.  $\frac{3x+5}{x^3-x^2-x+1}$

16.  $\frac{1}{x(x^n+1)}$

3.  $\frac{3x-1}{(x-1)(x-2)(x-3)}$

10.  $\frac{2x-3}{(x^2-1)(2x+3)}$

17.  $\frac{\cos x}{(1-\sin x)(2-\sin x)}$

4.  $\frac{x}{(x-1)(x-2)(x-3)}$

11.  $\frac{5x}{(x+1)(x^2-4)}$

18.  $\frac{(x^2+1)(x^2+2)}{(x^2+3)(x^2+4)}$

5.  $\frac{2x}{x^2+3x+2}$

12.  $\frac{x^3+x+1}{x^2-1}$

19.  $\frac{2x}{(x^2+1)(x^2+3)}$

6.  $\frac{1-x^2}{x(1-2x)}$

13.  $\frac{2}{(1-x)(1+x^2)}$

20.  $\frac{1}{x(x^4-1)}$

7.  $\frac{x}{(x^2+1)(x-1)}$

14.  $\frac{3x-1}{(x+2)^2}$

21.  $\frac{1}{e^x-1}$

Choose the correct answer in each of the Exercises 22 and 23.

22.  $\int \frac{x dx}{(x-1)(x-2)}$  equals

(A)  $\log\left|\frac{(x-1)^2}{x-2}\right| + C$

(B)  $\log \left| \frac{(x-2)^2}{x-1} \right| + C$

(C)  $\log \left| \frac{x-1}{x-2} \right|^2 + C$

(D)  $\log |(x-1)(x-2)| + C$

23.  $\int \frac{dx}{x(x^2+1)}$  equals

(A)  $\log |x| - \frac{1}{2} \log(x^2+1) + C$

(B)  $\log |x| + \frac{1}{2} \log(x^2+1) + C$

(C)  $-\log |x| + \frac{1}{2} \log(x^2+1) + C$

(D)  $\frac{1}{2} \log |x| + \log(x^2+1) + C$