

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

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

$$10. \sin^4 x$$

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

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

$$11. \cos^4 2x$$

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

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

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

$$16. \tan^4 x$$

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

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

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

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

Choose the correct answer in Exercises 23 and 24.

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

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

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

- (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:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Choose the correct answer in Exercises 24 and 25.

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

- (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. $\frac{x}{(x+1)(x+2)}$<br>2. $\frac{1}{x^2-9}$<br>3. $\frac{3x-1}{(x-1)(x-2)(x-3)}$<br>4. $\frac{x}{(x-1)(x-2)(x-3)}$<br>5. $\frac{2x}{x^2+3x+2}$<br>6. $\frac{1-x^2}{x(1-2x)}$<br>7. $\frac{x}{(x^2+1)(x-1)}$ | 8. $\frac{x}{(x-1)^2(x+2)}$<br>9. $\frac{3x+5}{x^3-x^2-x+1}$<br>10. $\frac{2x-3}{(x^2-1)(2x+3)}$<br>11. $\frac{5x}{(x+1)(x^2-4)}$<br>12. $\frac{x^3+x+1}{x^2-1}$<br>13. $\frac{2}{(1-x)(1+x^2)}$<br>14. $\frac{3x-1}{(x+2)^2}$ | 15. $\frac{1}{x^4-1}$<br>16. $\frac{1}{x(x^n+1)}$<br>17. $\frac{\cos x}{(1-\sin x)(2-\sin x)}$<br>18. $\frac{(x^2+1)(x^2+2)}{(x^2+3)(x^2+4)}$<br>19. $\frac{2x}{(x^2+1)(x^2+3)}$<br>20. $\frac{1}{x(x^4-1)}$<br>21. $\frac{1}{e^x-1}$ |
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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)  $\frac{1}{2} \log|x| + \log(x^2+1) + C$