

# Chapter 17

## General and Partial Fraction Integration Drill

## GENERAL AND PARTIAL FRACTION INTEGRATION DRILL

- Find  $f(x)$  if  $f(0) = 8$  and  $f'(x) = 1 - 6x$ .
  - $8 + x + 3x^2$
  - $8 + x - 3x^2$
  - $6 - x + 3x^2$
  - $-8 + x + 3x^2$
  - $1 - x - 3x^2$
- If  $f'(x) = 8x^3 + 12x + 3$ , find  $f(x)$  if  $f(1) = 6$ .
  - $2x^4 + 6x^2 + 3x - 5$
  - $5x^4 + 3x^2 + 2x + 5$
  - $-4x^4 + 6x^2 + 3x - 5$
  - $5x^4 + 6x^2 + 3x + 5$
  - $2x^4 - 6x^2 - 3x - 5$
- If  $f\left(\frac{\pi}{3}\right) = 4$ , and  $f'(x) = 2\cos x + \sec^2 x$ , then find  $f(x)$ .
  - $-2\cos x + \tan x + 4$
  - $2\sin x - \tan x + 4$
  - $2\sin x + \tan x + 4 - 2\sqrt{3}$
  - $-2\sin x + 2\sec x + 4 + 2\sqrt{3}$
  - $2\sin x + 2\tan x + 4 + 2\sqrt{3}$
- If  $f''(x) = 24x^2 + 2x + 10$ ,  $f(1) = 5$ , and  $f'(1) = -3$ , then  $f(x) =$ 
  - $2x^4 + x^3 + 5x^2 - 22x - \frac{59}{3}$
  - $2x^4 - \frac{x^3}{3} - 5x^2 - 22x + \frac{59}{3}$
  - $-2x^4 + \frac{x^3}{3} + 5x^2 - 22x + \frac{59}{3}$
  - $2x^4 - 4x^3 + 5x^2 - 22x + \frac{59}{3}$
  - $2x^4 + \frac{x^3}{3} + 5x^2 - 22x + \frac{59}{3}$
- Given  $f(0) = 2$ ,  $f'(0) = 1$ ,  $f''(x) = 4 - 6x - 40x^3$ , what is  $f(x)$ ?
  - $2 - x - 2x^2 - x^3 + 2x^5$
  - $2 + 2x + 3x^2 - x^3 - 6x^5$
  - $-2 + x + 2x^2 - x^3 - 2x^5$
  - $2 + x + 2x^2 - x^3 - 2x^5$
  - $2 + x + 2x^2 + x^3 + 6x^5$
- Given  $f''(x) = \sin x + \cos x$ ,  $f(0) = 3$ , and  $f'(0) = 4$ , then what is  $f(x)$ ?
  - $\sin x + \cos x + 5x + 4$
  - $\cos x - \sin x + 5x + 4$
  - $\sin x - \cos x - 5x - 4$
  - $\sin x - \cos x + 5x + 4$
  - $-\sin x - \cos x + 5x + 4$
- If  $f''(x) = 2 - 12x$ ,  $f(0) = 9$ , and  $f(2) = 15$ , then find  $f(x)$ .
  - $2x^3 - x^2 + 9x + 9$
  - $-2x^3 + x^2 - 9x + 9$
  - $2x^3 + x^2 + 9x + 9$
  - $-2x^3 - x^2 + 9x - 9$
  - $-2x^3 + x^2 + 9x + 9$

8. Find  $f(x)$  if  $f''(x) = 20x^3 + 12x^2 + 4$ ,  $f(0) = 8$ , and  $f(1) = 5$ .

- (A)  $-x^5 + x^4 + 2x^2 - 5x + 2$
- (B)  $x^5 + x^4 + 2x^2 - 7x + 8$
- (C)  $6x^5 + 5x^4 + 2x^2 - 7x + 8$
- (D)  $-x^5 + x^4 + 2x^2 - 7x + 8$
- (E)  $x^5 + x^4 + 2x^2 - 5x + 2$

9. Find  $f(x)$  if  $f'(0) = 2$ ,  $f(1) = 1$ , and  $f''(x) = 20x^3 + 12x^2 + 4$ .

- (A)  $x^5 + x^4 + 2x^2 - 5x + 2$
- (B)  $6x^5 + x^4 + 2x^2 - 5x + 2$
- (C)  $x^5 - x^4 - 2x^2 - 5x - 2$
- (D)  $-x^5 + x^4 + 2x^2 - 5x + 2$
- (E)  $x^5 + 5x^4 + 3x^2 - 5x + 2$

10. Find  $f(x)$  if  $f''(x) = 48x^2 - 6x + 1$ ,  $f(0) = 1$ , and  $f'(0) = 2$ .

- (A)  $x^4 - 4x^3 + \frac{1}{2}x^2 + 2x + 1$
- (B)  $x^4 - \frac{1}{2}x^3 + x^2 + 2x + 1$
- (C)  $4x^4 - x^3 + \frac{1}{2}x^2 + 2x + 1$
- (D)  $-4x^4 + x^3 + \frac{1}{2}x^2 + 2x + 1$
- (E)  $4x^4 + x^3 + 2x^2 + \frac{1}{2}x + 1$

11.  $\int_1^4 (5 - 2x + 3x^2) dx =$

- (A)  $-63$
- (B)  $-14$
- (C)  $2$
- (D)  $14$
- (E)  $63$

12.  $\int_0^2 x(2 + x^5) dx =$

- (A)  $-33$
- (B)  $-\frac{156}{7}$
- (C)  $0$
- (D)  $\frac{156}{7}$
- (E)  $33$

13.  $\int \frac{x^3 - 2\sqrt{x}}{x} dx =$

- (A)  $x^4 - x^2 + C$
- (B)  $x^{\frac{3}{2}} - x + C$
- (C)  $\frac{2}{3}x^{\frac{1}{3}} - 4\sqrt{x} + C$
- (D)  $\frac{1}{3}x^{\frac{1}{3}} - 4\sqrt{x} + C$
- (E)  $x^{\frac{1}{3}} - 4\sqrt{x} + C$

14.  $\int (3x^2 + 2x)(x^3 + x^2)^5 dx =$

- (A)  $\frac{1}{6}(x^3 + x^2)^6 + C$
- (B)  $\frac{1}{6}(3x^2 + 2x)^6 + C$
- (C)  $(x^3 + x^2)^6 + C$
- (D)  $(3x^2 + 2x)^6 + C$
- (E)  $-\frac{1}{6}(x^3 + x^2)^6 + C$

15.  $\frac{1}{2} \int \left( \frac{dx}{\sqrt{x}} \right) - 3 \int x^2 dx =$

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

16.  $\int (x^2 + x - x^{-1} + 2x^{-2}) dx =$

- (A)  $2x + 1 + x^2 - 4x^3 + C$
- (B)  $-\frac{1}{3}x^3 - \frac{1}{2}x^2 + \ln x + 2x^{-1} + C$
- (C)  $\frac{1}{3}x^3 + \frac{1}{2}x^2 - \ln x - 2x^{-1} + C$
- (D)  $2x - 1 - x^2 + 4x^3 + C$
- (E)  $3x + C$

17.  $\int (2x^2 + 3) dx =$

- (A)  $2x^3 + 3x + C$
- (B)  $x^3 + 3x + C$
- (C)  $\frac{2}{3}x^3 + 3x + C$
- (D)  $4x + C$
- (E)  $4x^3 + 3 + C$

18.  $\int x(2x^2 + 7)^5 dx =$

- (A)  $\frac{(2x^2 + 7)^4}{4} + C$
- (B)  $\frac{(2x^2 + 7)^6}{24} + C$
- (C)  $(2x^2 + 7)^6 + C$
- (D)  $\frac{(2x^2 + 7)^6}{6} + C$
- (E)  $(2x^2 + 7)^4 + C$

19.  $\int_0^3 (x^2 - x)(6x^3 - 9x^2) dx =$

- (A)  $\frac{725}{4}$
- (B)  $\frac{727}{4}$
- (C)  $\frac{729}{4}$
- (D)  $\frac{731}{4}$
- (E)  $\frac{733}{4}$

20. Find  $\frac{d}{dx} \int_7^{x^3} (2t - 3t^3) dt =$

- (A)  $-x^3$
- (B)  $6x^5 - 9x^{11}$
- (C)  $2x^3 - 3x^6$
- (D)  $2x^3 - 3x^9$
- (E)  $6x^6 - 3x^{18}$

$$21. \int_{-2}^2 \frac{1}{x^4} dx =$$

- (A) 0  
 (B)  $\frac{1}{24}$   
 (C)  $\frac{1}{12}$   
 (D)  $\frac{1}{8}$   
 (E) The integral diverges.

$$22. \int \frac{x-9}{(x+5)(x-2)} dx =$$

- (A)  $-2 \int \frac{dx}{(x+5)} + \int \frac{dx}{(x-2)}$   
 (B)  $\int \frac{dx}{(x+5)} - 2 \int \frac{dx}{(x-2)}$   
 (C)  $2 \int \frac{dx}{(x+5)} + 2 \int \frac{dx}{(x-2)}$   
 (D)  $2 \int \frac{dx}{(x+5)} - \int \frac{dx}{(x-2)}$   
 (E)  $\int \frac{dx}{(x+5)} - \int \frac{dx}{(x-2)}$

$$23. \int \frac{1}{(x+4)(x-1)} dx =$$

- (A)  $\frac{1}{5} \int \frac{dx}{(x+4)} - \frac{1}{5} \int \frac{dx}{(x-1)}$   
 (B)  $-\frac{1}{5} \int \frac{dx}{(x+4)} + \frac{1}{5} \int \frac{dx}{(x-1)}$   
 (C)  $-\frac{4}{5} \int \frac{dx}{(x+4)} + \frac{4}{5} \int \frac{dx}{(x-1)}$   
 (D)  $\frac{4}{5} \int \frac{dx}{(x+4)} - \frac{4}{5} \int \frac{dx}{(x-1)}$   
 (E)  $\frac{1}{5} \int \frac{dx}{(x+4)} + \frac{1}{5} \int \frac{dx}{(x-1)}$

$$24. \int \frac{2}{x^2-1} dx =$$

- (A)  $-\ln|x-1| + \ln|x+1| + C$   
 (B)  $2|\ln|x-1| - \ln|x+1|| + C$   
 (C)  $\ln|x-1| - \ln|x+1| + C$   
 (D)  $\ln|x-1| - 2\ln|x+1| + C$   
 (E)  $2\ln|x-1| - 2\ln|x+1| + C$

$$25. \int \frac{3}{x^2+x-2} dx =$$

- (A)  $-\int \frac{dx}{(x+2)} + \int \frac{dx}{(x-1)}$   
 (B)  $\int \frac{dx}{(x+2)} - \int \frac{dx}{(x-1)}$   
 (C)  $-3 \int \frac{dx}{(x+2)} + \int \frac{dx}{(x-1)}$   
 (D)  $3 \int \frac{dx}{(x+2)} - \int \frac{dx}{(x-1)}$   
 (E)  $\int \frac{dx}{(x+2)} + \int \frac{dx}{(x-1)}$

$$26. \int \frac{5-x}{2x^2+x-1} dx =$$

- (A)  $-3 \int \frac{dx}{(2x-1)} + 2 \int \frac{dx}{(x+1)}$   
 (B)  $5 \int \frac{dx}{(2x-1)} - \int \frac{dx}{(x+1)}$   
 (C)  $2 \int \frac{dx}{(2x-1)} - 3 \int \frac{dx}{(x+1)}$   
 (D)  $-2 \int \frac{dx}{(2x-1)} - 3 \int \frac{dx}{(x+1)}$   
 (E)  $3 \int \frac{dx}{(2x-1)} - 2 \int \frac{dx}{(x+1)}$

$$27. \int \frac{x^2 + 12x + 12}{x^3 - 4x} dx =$$

$$(A) -3 \int \frac{dx}{x} - \int \frac{dx}{(x+2)} + 5 \int \frac{dx}{(x-2)}$$

$$(B) -5 \int \frac{dx}{x} - 3 \int \frac{dx}{(x+2)} + \int \frac{dx}{(x-2)}$$

$$(C) 3 \int \frac{dx}{x} - \int \frac{dx}{(x+2)} - 5 \int \frac{dx}{(x-2)}$$

$$(D) \int \frac{dx}{x} - 3 \int \frac{dx}{(x+2)} + 5 \int \frac{dx}{(x-2)}$$

$$(E) -3 \int \frac{dx}{x} + \int \frac{dx}{(x+2)} - 5 \int \frac{dx}{(x-2)}$$

$$28. \int \frac{4x^2 + 2x - 1}{x^3 + x^2} dx =$$

$$(A) -3 \int \frac{dx}{x} + \int \frac{dx}{x^2} - \int \frac{dx}{(x+1)}$$

$$(B) \int \frac{dx}{x} - 3 \int \frac{dx}{x^2} + \int \frac{dx}{(x+1)}$$

$$(C) -\int \frac{dx}{x} - \int \frac{dx}{x^2} + 3 \int \frac{dx}{(x+1)}$$

$$(D) \int \frac{dx}{x} + 3 \int \frac{dx}{x^2} - \int \frac{dx}{(x+1)}$$

$$(E) 3 \int \frac{dx}{x} - \int \frac{dx}{x^2} + \int \frac{dx}{(x+1)}$$

$$29. \int \frac{x^2 - 1}{x^3 + x} dx =$$

$$(A) \int \frac{dx}{x} - \int \frac{2x}{(x^2 + 1)}$$

$$(B) -\int \frac{dx}{x} + \int \frac{2x}{(x^2 + 1)}$$

$$(C) 2 \int \frac{dx}{x} + \int \frac{2x}{(x^2 + 1)}$$

$$(D) -2 \int \frac{dx}{x} - \int \frac{2x}{(x^2 + 1)}$$

$$(E) -\int \frac{dx}{x} - \int \frac{2x}{(x^2 + 1)}$$

$$30. \int \frac{1}{x^2 + x} dx =$$

$$(A) \ln x + \ln |x + 1| + C$$

$$(B) -\ln x + \ln |x + 1| + C$$

$$(C) \ln x - \ln |x + 1| + C$$

$$(D) -\ln x - \ln |x + 1| + C$$

$$(E) \ln x - \ln |x - 1| + C$$

$$31. \int \frac{1}{2x^2 + x} dx =$$

$$(A) -\ln x - \ln |2x + 1| + C$$

$$(B) \ln x + \ln |2x + 1| + C$$

$$(C) -\ln x + \ln |2x + 1| + C$$

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

$$(E) \ln x - \ln |2x - 1| + C$$

32.  $\int y(y^2 + 1)^5 dy =$

- (A)  $(y^2 + 1)^6 + C$
- (B)  $\frac{1}{4}(y^2 + 1)^4 + C$
- (C)  $\frac{1}{5}(y^2 + 1)^5 + C$
- (D)  $\frac{1}{6}(y^2 + 1)^6 + C$
- (E)  $\frac{1}{12}(y^2 + 1)^6 + C$

33.  $\int \frac{\sqrt{x} - 2x^2}{x} dx =$

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

34.  $\int_{-4}^{-2} (x^3 + 5x^2 - 7) dx =$

- (A) 19.333
- (B) 24.667
- (C) 33
- (D) 38.333
- (E) 46

35. If the series  $\sum_{n=1}^{\infty} \frac{6}{4^n}$  converges, then which of the following series will not converge?

- (A)  $\sum_{n=1}^{\infty} \frac{1}{2 + 4^n}$
- (B)  $\sum_{n=1}^{\infty} \frac{6}{4n}$
- (C)  $\sum_{n=1}^{\infty} \frac{1}{4^n}$
- (D)  $\sum_{n=1}^{\infty} \frac{6n}{4^n}$
- (E)  $\sum_{n=1}^{\infty} \frac{6}{2 + 4^n}$

36. To what value does the series  $\sum_{n=1}^{\infty} (n+1)2^n$  converge?

- (A) 0
- (B)  $\frac{1}{2}$
- (C) 1
- (D) 2
- (E) The series diverges.

37. A particle's acceleration is given by  $a(t) = 6t^2 - 4$ . Its initial position is 1 and its velocity at  $t = 2$  is 9. What is the position of the particle at  $t = 4$ ?

- (A) 113
- (B) 110
- (C) 101
- (D) 100
- (E) 92

38. Find the average value of  $f(x) = x^3 - 2$  from  $x = 1$  to  $x = 3$ .

- (A) 2
- (B) 4
- (C) 8
- (D) 16
- (E) 32