



## MATHS

### NCERT - NCERT MATHEMATICS(TELUGU)

## INTEGRALS

### Examples

1. Write an anti derivative for each of the following functions using the method of inspection:

(i)  $\cos 2x$  (ii)  $3x^2 + 4x^3$  (iii)  $\frac{1}{x}, x \neq 0$



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2. Find the following integrals:

$$(i) \int \frac{x^3 - 1}{x^2} dx \quad (ii) \int (x^{\frac{2}{3}} + 1) dx \quad (iii) \int \left( x^{\frac{3}{2}} + 2e^x - \frac{1}{x} \right) dx$$

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3. Find the following integrals:

$$(i) \int (\sin x + \cos x) dx \quad (ii) \int \cos ex (\cos ex + \cot x) dx \quad (iii) \int \frac{1 - \sin x}{\cos^2 x} dx$$

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4. Find the anti derivative F of f defined by  $f(x) = 4x^3 - 6$ , where  $F(0) = 3$

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5. Integrate the following functions w.r.t.  $x$ :

(i)  $\sin mx$  (ii)  $2x \sin(x^2 + 1)$  (iii)  $\frac{\tan^4 \sqrt{x} \sec^2 \sqrt{x}}{\sqrt{x}}$  (iv)  $\frac{\sin(\tan^{-1} x)}{1 + x^2}$

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6. Find the following integrals:

(i)  $\int \sin^3 x \cos^2 x dx$  (ii)  $\int \frac{\sin x}{\sin(x + a)} dx$  (iii)  $\int \frac{1}{1 + \tan x} dx$

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7. Find (i)  $\int \cos^2 x dx$  (ii)  $\int \sin 2x \cos 3x dx$  (iii)  $\int \sin^3 x dx$

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8. Find the following integrals:

(i)  $\int \frac{dx}{x^2 - 16}$  (ii)  $\int \frac{dx}{\sqrt{2x - x^2}}$

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9. Find  $\int \frac{dx}{(x+1)(x+2)}$

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10. Find  $\int \frac{x^2 + 1}{x^2 - 5x + 6} dx$

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

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12. Find  $\int \frac{x^2}{(x^2 + 1)(x^2 + 4)} dx$



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13. Find  $\int \frac{(3 \sin \phi - 2) \cos \phi}{5 - \cos^2 \phi - 4 \sin \phi} d\phi$

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14. Find  $\int \frac{x^2 + x + 1 dx}{(x + 2)(x^2 + 1)}$

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15. Find  $\int x \cos x dx$

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16. Find  $\int \log x dx$

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17. Find  $\int x e^x dx$

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18. Find  $\int \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx$

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19. Find  $\int e^x \sin x dx$

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20. Find (i)  $\int e^x \left( \tan^{-1} x + \frac{1}{1+x^2} \right) dx$  (ii)  $\int \frac{(x^2+1)e^x}{(x+1)^2} dx$

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21. Find  $\int \sqrt{x^2 + 2x + 5} dx$

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22. Find  $\int \sqrt{3 - 2x - x^2} dx$

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23. Evaluate  $\int_0^2 e^x dx$  as the limit of a sum.

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24. Evaluate  $\int_{-1}^1 5x^4 \sqrt{x^5 + 1} dx$

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25. Evaluate  $\int_0^1 \frac{\tan^{-1} x}{1+x^2} dx$

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26. Evaluate  $\int_{-1}^2 |x^3 - x| dx$

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27. Evaluate  $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \sin^2 x dx$

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28. Evaluate the integral

$$\int_0^{\pi} \frac{x \sin x}{1 + \cos^2 x} dx$$

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29. Evaluate  $\int_{-1}^1 \sin^5 x \cos^4 x dx$

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30. Evaluate  $\int_0^{\frac{\pi}{2}} \frac{\sin^4 x}{\sin^4 x + \cos^4 x} dx$

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31. Evaluate  $\pi \frac{\frac{\pi}{3}}{\frac{\pi}{6}} \frac{dx}{1 + \sqrt{\tan x}}$

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32.  $\int_0^{\pi/2} \log(\sin x) dx =$

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33. Find  $\int \cos 6x \sqrt{1 + \sin 6x} dx$

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34. Find  $\int \frac{(x^4 - x)^{\frac{1}{4}}}{x^5} dx$

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35. Find  $\int \frac{\sin 2x \cos 2x dx}{\sqrt{9 - \cos^4(2x)}}$

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36.  $\int_0^{\pi} \frac{x dx}{a^2 \cos^2 x + b^2 \sin^2 x} =$

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## Exercise 7 1

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

$$\sin 2x$$

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

$$\cos 3x$$

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

$$e^{2x}$$



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

$$(ax + b)^2$$



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

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



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6. Find the following integrals

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





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7. Find the following integrals

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



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8. Find the following integrals

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



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9. Find the following integrals

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



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10. Find the following integrals

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

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

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12. Find the following integrals

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

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13. Find the following integrals

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

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14. Find the following integrals

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

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15. Find the following integrals

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

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16. Find the following integrals

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

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17. Find the following integrals

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

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18. Find the following integrals

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

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19. Find the following integrals

$$\int \frac{\sec^2 x}{\cos e^{c^2 x}} dx$$

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20. Find the following integrals

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



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21. Choose the correct answer

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

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

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

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

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

Answer: C



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22. Choose the correct answer

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.  $x^3 + \frac{1}{x^4} - \frac{129}{8}$

**Answer: A**

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## Exercise 7 2

1. Integrate the functions

$$\frac{2x}{1+x^2}$$

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2. Integrate the functions

$$\frac{(\log x)^2}{x}$$



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3. Integrate the functions

$$\frac{1}{x + x \log x}$$



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4. Integrate the functions

$$\sin x \sin(\cos x)$$



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5. Integrate the functions

$$\sin(ax + b)\cos(ax + b)$$



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6. Integrate the functions

$$\sqrt{ax + b}$$



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7. Integrate the functions

$$x\sqrt{x + 2}$$



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8. Integrate the functions

$$x\sqrt{1+2x^2}$$

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9. Integrate the functions

$$(4x+2)\sqrt{x^2+x+1}$$

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10. Integrate the functions

$$\frac{1}{x-\sqrt{x}}$$

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11. Integrate the functions

$$\frac{x}{\sqrt{x+4}}, x > 0$$

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12. Integrate the functions

$$(x^3 - 1)^{\frac{1}{3}} x^5$$

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13. Integrate the functions

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

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**14.** Integrate the functions

$$\frac{1}{x(\log x)^m}, x > 0, m \neq 1$$

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**15.** Integrate the functions

$$\frac{x}{9 - 4x^2}$$

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**16.** Integrate the functions

$$e^{2x+3}$$

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**17.** Integrate the functions

$$\frac{x}{e^{x^2}}$$



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**18.** Evaluate the integrals.

$$\int \frac{e^{\tan^{-1} x}}{1+x^2} dx \text{ on } I \subset (0, \infty).$$



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**19.** Integrate the functions

$$\frac{e^{2x} - 1}{e^{2x} + 1}$$



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20. Integrate the functions

$$\frac{e^{2x} - e^{-2x}}{e^{2x} + e^{-2x}}$$

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21. Integrate the functions

$$\tan^2(2x - 3)$$

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22. Integrate the functions

$$\sec^2(7 - 4x)$$

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23.  $\int \frac{\sin^{-1} x}{\sqrt{1 - x^2}} dx =$

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**24.** Integrate the functions

$$\frac{2 \cos x - 3 \sin x}{6 \cos x + 4 \sin x}$$

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**25.** Integrate the functions

$$\frac{1}{\cos^2 x (1 - \tan x)^2}$$

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**26.** Evaluate the integrals.

$$\int \frac{\cos \sqrt{x}}{\sqrt{x}} dx \text{ on } (0, \infty).$$

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27. Integrate the functions

$$\sqrt{\sin 2x} \cos 2x$$



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28. Integrate the functions

$$\frac{\cos x}{\sqrt{1 + \sin x}}$$



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29. Integrate the functions

$$\cot x \log \sin x$$



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**30.** Integrate the functions

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

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**31.** Integrate the functions

$$\frac{\sin x}{(1 + \cos x)^2}$$

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**32.** Integrate the functions

$$\frac{1}{1 + \cot x}$$

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**33.** Integrate the functions

$$\frac{1}{1 - \tan x}$$

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**34.** Integrate the functions

$$\frac{\sqrt{\tan x}}{\sin x \cos x}$$

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**35.** Integrate the functions

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

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**36.** Integrate the functions

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

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**37.** Integrate the functions

$$\frac{x^3 \sin(\tan^{-1} x^4)}{1 + x^8}$$

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**38.** Choose the correct answer

$$\int \frac{10x^9 + 10^x \log_e 10 dx}{x^{10} + 10^x} \text{ equals}$$

A.  $10^x - x^{10} + C$

B.  $10^x + x^{10} + C$

C.  $(10^x - x^{10})^{-1} + C$

D.  $\log(10^x + x^{10}) + C$

**Answer: D**

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**39.** Choose the correct answer

$\int \frac{dx}{\sin^2 x \cos^2 x}$  equals

A.  $\tan x + \cot x + C$

B.  $\tan x - \cot x + C$

C.  $\tan x \cot x + C$

D.  $\tan x - \cot 2x + C$

**Answer: B**

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## Exercise 7 3

1. Find the integrals of the functions

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



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2. Find the integrals of the functions

$$\sin 3x \cos 4x$$



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3. Find the integrals of the functions

$$\cos 2x \cos 4x \cos 6x$$



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4. Find the integrals of the functions

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



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5. Find the integrals of the functions

$$\sin^3 x \cos^3 x$$



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6. Evaluate the integrals.

$$\int \sin x \sin 2x \cdot \sin 3x dx \text{ on } \mathbb{R}.$$



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7. Find the integrals of the functions

$$\sin 4x \sin 8x$$



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8. Find the integrals of the functions

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



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9. Find the integrals of the functions

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



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10. Find the integrals of the functions

$$\sin^4 x$$



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11. Find the integrals of the functions

$$\cos^4 2x$$

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

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13. Find the integrals of the functions

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

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14. Find the integrals of the functions

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



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15. Find the integrals of the functions

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

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16. Find the integrals of the functions

$$\tan^4 x$$

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

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18. Find the integrals of the functions

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

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19. Find the integrals of the functions

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

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20. Find the integrals of the functions

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

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21. Find the integrals of the functions

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

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22. Find the integrals of the functions

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

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23. Choose the correct answer

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

A.  $\tan x + \cot x + C$

B.  $\tan x + \operatorname{cosec} x + C$

C.  $-\tan x + \cot x + C$

D.  $\tan x + \sec x + C$

**Answer: A**

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

A.  $-\cot(e^{x^2}) + C$

B.  $\tan(xe^x) + C$

C.  $\tan(e^x) + C$

D.  $\cot(e^x) + C$

**Answer: B**

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## Exercise 7 4

1. Evaluate the integrals.

$$\int \frac{3x^2}{1+x^6} dx, \text{ on } \mathbb{R}.$$

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2. Integrate the function

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

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3. Integrate the function

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

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4. Integrate the function

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



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5. Integrate the function

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



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6. Integrate the function

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



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7. Integrate the function

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

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8. Integrate the function

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

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9. Integrate the function

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

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10. Integrate the function

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

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11. Integrate the function

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

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12. Integrate the function

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

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13. Integrate the function

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

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14. Integrate the function

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

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15. Integrate the function

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

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**16.** Integrate the function

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

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**17.** Integrate the function

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

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**18.** Integrate the function

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

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19. Integrate the function

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

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20. Integrate the function

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

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21. Integrate the function

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

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22. Integrate the function

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

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23. Integrate the function

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

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24. Choose the correct answer

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

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

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

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

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

**Answer: B**

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**25.** Choose the correct answer

$\int \frac{dx}{\sqrt{9x - 4x^2}}$  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.  $\frac{1}{2} \sin^{-1} \left( \frac{9x - 8}{9} \right) + C$

**Answer: B**

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## Exercise 7 5

1. Integrate the rational functions

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



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2. Integrate the rational functions

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



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3. Integrate the rational functions

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



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#### 4. Integrate the rational functions

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

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#### 5. Integrate the rational functions

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

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#### 6. Integrate the rational functions

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

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### 7. Integrate the rational functions

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

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### 8. Integrate the rational functions

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

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### 9. Integrate the rational functions

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

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**10. Integrate the rational functions**

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

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**11. Integrate the rational functions**

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

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**12. Integrate the rational functions**

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

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**13.** Integrate the rational functions

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



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**14.** Integrate the rational functions

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



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**15.** Integrate the rational functions

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



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**16.** Integrate the rational functions

$$\frac{1}{x(x^n + 1)} \quad [\text{Hint: multiply numerator and denominator by } x^{n-1} \text{ and put } x^n = t]$$

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**17.**  $\frac{\cos x}{(1 - \sin x)(2 - \sin x)}$  [Hint : Put  $\sin x = t$ ]

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**18.** Integrate the rational functions

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

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19. Integrate the rational functions

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



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20. Integrate the rational functions

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



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21. Integrate the rational functions

$$\frac{1}{(e^x - 1)} \text{ [Hint : Put } e^x = t]$$



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22. Choose the correct answer

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

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

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

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

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

**Answer: B**

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23. Choose the correct answer

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

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

**Answer: A**

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## Exercise 7 6

**1. Integrate the functions**

$x \sin x$

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**2. Integrate the functions**

$x \sin 3x$

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### 3. Integrate the functions

$$x^2 e^x$$

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### 4. Integrate the functions

$$x \log x$$

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### 5. Integrate the functions

$$x \log 2x$$

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**6.** Integrate the functions

$$x^2 \log x$$



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**7.** Integrate the functions

$$x \sin^{-1} x$$



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**8.** Integrate the functions

$$x \tan^{-1} x$$



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**9. Integrate the functions**

$$x \cos^{-1} x$$



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**10. Integrate the functions**

$$(\sin^{-1} x)^2$$



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**11. Integrate the functions**

$$\frac{x \cos^{-1} x}{\sqrt{1-x^2}}$$



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**12. Integrate the functions**

$$x \sec^2 x$$

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**13. Integrate the functions**

$$\tan^{-1} x$$

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**14. Integrate the functions**

$$x(\log x)^2$$

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**15.** Integrate the functions

$$(x^2 + 1)\log x$$



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**16.** Integrate the functions

$$e^x(\sin x + \cos x)$$



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**17.** Integrate the functions

$$\frac{xe^x}{(1+x)^2}$$



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**18.** Integrate the functions

$$e^x \left( \frac{1 + \sin x}{1 + \cos x} \right)$$

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**19.** Integrate the functions

$$e^x \left( \frac{1}{x} - \frac{1}{x^2} \right)$$

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**20.** Integrate the functions

$$\frac{(x - 3)e^x}{(x - 1)^3}$$

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## 21. Integrate the functions

$$e^{2x} \sin x$$



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## 22. Integrate the functions

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



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## 23. Choose the correct answer

$$\int x^2 e^{x^3} dx \text{ equals}$$

A.  $\frac{1}{3}e^{x^3} + C$

B.  $\frac{1}{3}e^{x^2} + C$

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



D.  $\frac{1}{2}e^{x^2} + C$

**Answer: A**

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24.  $\int e^x \sec x (1 + \tan x) dx =$

A.  $e^x \cos x + C$

B.  $e^x \sec x + C$

C.  $e^x \sin x + C$

D.  $e^x \tan x + C$

**Answer: B**

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1. Choose the correct answer

$\int \sqrt{1+x^2} dx$  is equal to

A.  $\frac{x}{2} \sqrt{1+x^2} + \frac{1}{2} \log \left| x + \sqrt{1+x^2} \right| + C$

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

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

D.  $\frac{x^2}{2} \sqrt{1+x^2} + \frac{1}{2} x^2 \log \left| x + \sqrt{1+x^2} \right| + C$

Answer: A



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2. Choose the correct answer

$\int \sqrt{x^2 - 8x + 7} dx$  is equal to

A.

$$\frac{1}{2}(x - 4)\sqrt{x^2 - 8x + 7} + 9\log|x - 4 + \sqrt{x^2 - 8x + 7}| + C$$

B.

$$\frac{1}{2}(x + 4)\sqrt{x^2 - 8x + 7} + 9\log|x + 4 + \sqrt{x^2 - 8x + 7}| + C$$

C.

$$\frac{1}{2}(x - 4)\sqrt{x^2 - 8x + 7} - 3\sqrt{2}\log|x - 4 + \sqrt{x^2 - 8x + 7}| + C$$

D.

$$\frac{1}{2}(x - 4)\sqrt{x^2 - 8x + 7} - \frac{9}{2}\log|x - 4 + \sqrt{x^2 - 8x + 7}| + C$$

**Answer: B**



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**Exercise 7 8**

1. Evaluate the following definite integrals as limit of sums.

$$\int_a^b x dx$$

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2. Evaluate the following definite integrals as limit of sums.

$$\int_0^5 (x + 1) dx$$

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3. Evaluate the following definite integrals as limit of sums.

$$\int_2^3 x^2 dx$$

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4. Evaluate the following definite integrals as limit of sums.

$$\int_1^4 (x^2 - x) dx$$

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5. Evaluate the following definite integrals as limit of sums.

$$\int_{-1}^1 e^x dx$$

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6. Evaluate the integrals as limit of a sum.

$$\int_0^4 (x + 2^{2x}) dx$$

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1. Evaluate the definite integrals

$$\int_{-1}^1 (x + 1)dx$$



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2. Evaluate the definite integrals

$$\int_2^3 \frac{1}{x} dx$$



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3. Evaluate the definite integrals

$$\int_1^2 (4x^3 - 5x^2 + 6x + 9)dx$$



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4. Evaluate the definite integrals

$$\int_0^{\frac{\pi}{4}} \sin 2x dx$$

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5. Evaluate the definite integrals

$$\int_0^{\frac{\pi}{2}} \cos 2x dx$$

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6. Evaluate the definite integrals

$$\int_4^5 e^x dx$$

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7. Evaluate the definite integrals

$$\int_0^{\frac{\pi}{4}} \tan x dx$$

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8. Evaluate the definite integrals

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{4}} \cos ex dx$$

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9. Evaluate the definite integrals

$$\int_0^1 \frac{dx}{\sqrt{1+x^2}}$$

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10. Evaluate the definite integrals

$$\int_0^1 \frac{dx}{1+x^2}$$

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11. Evaluate the definite integrals

$$\int_2^3 \frac{dx}{x^2-1}$$

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12. Evaluate the definite integrals

$$\int_0^{\frac{\pi}{2}} \cos^2 x dx$$

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13. Evaluate the definite integrals

$$\int_2^3 \frac{x dx}{x^2 + 1}$$

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14. Evaluate the definite integrals

$$\int_0^1 \frac{2x + 3}{5x^2 + 1} dx$$

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15. Evaluate the definite integrals

$$\int_0^1 x e^{x^2} dx$$

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16. Evaluate the definite integrals

$$\int_1^2 \frac{5x^2}{x^2 + 4x + 3}$$

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17. Evaluate the definite integrals

$$\int_0^{\frac{\pi}{4}} (2 \sec^2 x + x^3 + 2) dx$$

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18. Evaluate the definite integrals

$$\int_0^{\pi} \left( \frac{\sin^2 x}{2} - \frac{\cos^2 x}{2} \right) dx$$

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19. Evaluate the definite integrals

$$\int_0^2 \frac{6x + 3}{x^2 + 4} dx$$

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20. Evaluate the definite integrals

$$\int_0^1 \left( xe^x + \frac{\sin(\pi x)}{4} \right) dx$$

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21. Choose the correct answer

$$\int_1^{\sqrt{3}} \frac{dx}{1 + x^2} \text{ equals}$$

A.  $\frac{\pi}{3}$

B.  $\frac{2\pi}{3}$

C.  $\frac{\pi}{6}$

D.  $\frac{\pi}{12}$

**Answer: D**

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**22.** Choose the correct answer

$$\int_0^{\frac{2}{3}} \frac{dx}{4 + 9x^2} \text{ equals}$$

A.  $\frac{\pi}{6}$

B.  $\frac{\pi}{12}$

C.  $\frac{\pi}{24}$

D.  $\frac{\pi}{4}$

**Answer: C**

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1. Evaluate the integrals by using substitution

$$\int_0^1 \frac{x}{x^2 + 1} dx$$

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2. Evaluate the integrals by using substitution

$$\int_0^{\frac{\pi}{2}} \sqrt{\sin \phi} \cos^5 \phi d\phi$$

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3. Evaluate the integrals by using substitution

$$\int_0^1 \sin^{-1} \left( \frac{2x}{1+x^2} \right) dx$$

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4. Evaluate the integrals by using substitution

$$\int_0^2 x\sqrt{x+2} \text{ (Put } x+2=t^2)$$

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5. Evaluate the integrals by using substitution

$$\int_0^{\frac{\pi}{2}} \frac{\sin x}{1+\cos^2 x} dx$$

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6. Evaluate the integrals by using substitution

$$\int_0^2 \frac{dx}{x+4-x^2}$$

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7. Evaluate the integrals by using substitution

$$\int_{-1}^1 \frac{dx}{x^2 + 2x + 5}$$

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8. Evaluate the integrals by using substitution

$$\int_1^2 \left( \frac{1}{x} - \frac{1}{2x^2} \right) e^{2x} dx$$

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9. Choose the correct answer

The value of the integral  $\int_{\frac{1}{3}}^1 \frac{(x - x^3)^{\frac{1}{3}}}{x^4} dx$  is

A. 6

B. 0

C. 3



D. 4

**Answer: A**

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**10.** Choose the correct answer

If  $f(x) = \int_0^x t \sin t dt$ , then  $f'(x)$  is

A.  $\cos x + x \sin x$

B.  $x \sin x$

C.  $x \cos x$

D.  $\sin x + x \cos x$

**Answer: B**

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## Exercise 7 11

1. By using the properties of definite integrals, evaluate the integrals

$$\int_0^{\frac{\pi}{2}} \cos^2 x dx$$

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2. By using the properties of definite integrals, evaluate the integrals

$$\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$$

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3. By using the properties of definite integrals, evaluate the integrals

$$\int_0^{\frac{\pi}{2}} \frac{\sin^{\frac{3}{2}} x dx}{\sin^{\frac{3}{2}} x + \cos^{\frac{3}{2}} x}$$

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4. By using the properties of definite integrals, evaluate the integrals

$$\int_0^{\frac{\pi}{2}} \frac{\cos^5 x dx}{\sin^5 x + \cos^5 x}$$

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5. By using the properties of definite integrals, evaluate the integrals

$$\int_{-5}^5 |x + 2| dx$$

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6. By using the properties of definite integrals, evaluate the integrals

$$\int_2^8 |x - 5| dx$$

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7.  $\int_0^1 x(1-x)^n dx =$



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8. By using the properties of definite integrals, evaluate the integrals

$$\int_0^{\frac{\pi}{4}} \log(1 + \tan x) dx$$



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9. By using the properties of definite integrals, evaluate the integrals

$$\int_0^2 x \sqrt{2-x} dx$$



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10. By using the properties of definite integrals, evaluate the integrals

$$\int_0^{\frac{\pi}{2}} (2 \log \sin x - \log \sin 2x) dx$$



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11. By using the properties of definite integrals, evaluate the integrals

$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^2 x dx$$

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12. By using the properties of definite integrals, evaluate the integrals

$$\int_0^{\pi} \frac{x dx}{1 + \sin x}$$

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13. By using the properties of definite integrals, evaluate the integrals

$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^7 x dx$$

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14. By using the properties of definite integrals, evaluate the integrals

$$\int_0^{2\pi} \cos^5 x dx$$

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15. By using the properties of definite integrals, evaluate the integrals

$$\int_0^{\frac{\pi}{2}} \frac{\sin x - \cos x}{1 + \sin x \cos x} dx$$

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16. By using the properties of definite integrals, evaluate the integrals

$$\int_0^{\pi} \log(1 + \cos x) dx$$

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**17.** By using the properties of definite integrals, evaluate the integrals

$$\int_0^a \frac{\sqrt{x}}{\sqrt{x} + \sqrt{a-x}} dx$$

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**18.** By using the properties of definite integrals, evaluate the integrals

$$\int_0^4 |x - 1| dx$$

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19. Show that  $\int_0^a f(x)g(x)dx = 2\int_0^a f(x)dx$ , if  $f$  and  $g$  are defined as  $f(x) = f(a-x)$  and  $g(x) + g(a-x) = 4$

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20. The value of  $\int_{-\pi/2}^{\pi/2} (x^3 + x \cos x + \tan^5 x + 1)dx =$

A. 0

B. 2

C.  $\pi$

D. 1

**Answer: C**

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21. Choose the correct answer

The value of  $\int_0^{\frac{\pi}{2}} \log\left(\frac{4 + 3 \sin x}{4 + 3 \cos x}\right) dx$  is

A. 2

B.  $\frac{3}{4}$

C. 0

D. -2

**Answer: C**



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## Exercise 7 12

1. Integrate the functions

$$\frac{1}{x - x^3}$$



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2. Integrate the functions

$$\frac{1}{\sqrt{x+a} + \sqrt{x+b}}$$

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3. Integrate the functions

$$\frac{1}{x\sqrt{ax-x^2}} \quad [\text{Hint: Put } x = \frac{a}{t}]$$

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4. Integrate the functions

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

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### 5. Integrate the functions

$$\frac{1}{x^{\frac{1}{2}} + x^{\frac{1}{3}}} \quad [\text{Hint: } \frac{1}{x^{\frac{1}{2}} + x^{\frac{1}{3}}} = \frac{1}{x^{\frac{1}{3}}(1 + x^{\frac{1}{6}})}, \text{ put } x = t^6]$$

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### 6. Integrate the functions

$$\frac{5x}{(x + 1)(x^2 + 9)}$$

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### 7. Integrate the functions

$$\frac{\sin x}{\sin(x - a)}$$

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## 8. Integrate the functions

$$\frac{e^{5 \log x} - e^{4 \log x}}{e^{3 \log x} - e^{2 \log x}}$$



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## 9. Integrate the functions

$$\frac{\cos x}{\sqrt{4 - \sin^2 x}}$$



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## 10. Integrate the functions

$$\frac{\sin^8 x - \cos^8 x}{1 - 2 \sin^2 x \cos^2 x}$$



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11. Integrate the functions

$$\frac{1}{\cos(x + a)\cos(x + b)}$$



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12. Integrate the functions

$$\frac{x^3}{\sqrt{1 - x^8}}$$



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13. Integrate the functions

$$\frac{e^x}{(1 + e^x)(2 + e^x)}$$



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**14.** Integrate the functions

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



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**15.** Integrate the functions

$$\cos^3 x e^{\log \sin x}$$



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**16.** Integrate the functions

$$e^{3 \log x} (x^4 + 1)^{-1}$$



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**17. Integrate the functions**

$$f'(ax + b)[f(ax + b)]^n$$

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**18. Integrate the functions**

$$\frac{1}{\sqrt{9} \sin^3 x \sin(x + \alpha)}$$

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**19. Integrate the functions**

$$\frac{\sin^{-1} \sqrt{x} - \cos^{-1} \sqrt{x}}{\sin^{-1} \sqrt{x} + \cos^{-1} \sqrt{x}}, \xi \in [0, 1]$$

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20. Integrate the functions

$$\sqrt{\frac{1 - \sqrt{x}}{1 + \sqrt{x}}}$$

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21. Integrate the functions

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

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22. Integrate the functions

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

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**23.** Integrate the functions

$$\tan^{-1} \sqrt{\frac{1-x}{1+x}}$$

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**24.** Integrate the functions

$$\frac{\sqrt{x^2 + 1} [\log(x^2 + 1) - 2 \log x]}{x^4}$$

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**25.** Evaluate the definite integrals

$$\int_{\frac{\pi}{2}}^{\pi} e^x \left( \frac{1 - \sin x}{1 - \cos x} \right) dx$$

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26. Evaluate the definite integrals

$$\int_0^{\frac{\pi}{4}} \frac{\sin x \cos x}{\cos^4 x + \sin^4 x} dx$$

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27. Evaluate the definite integrals

$$\int_0^{\frac{\pi}{2}} \frac{\cos^2 x dx}{\cos^2 x + 4 \sin^2 x}$$

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28. Evaluate the definite integrals

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sin x + \cos x}{\sqrt{\sin 2x}} dx$$

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29. Evaluate the definite integrals

$$\int_0^1 \frac{dx}{\sqrt{1+x} - \sqrt{x}}$$

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30. Evaluate the integral

$$I = \int_0^{\pi/4} \frac{\sin x + \cos x}{9 + 16 \sin 2x} dx$$

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31. Evaluate the definite integrals

$$\int_0^{\pi/2} \sin 2x \tan^{-1}(\sin x) dx$$

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32.  $\int_0^{\pi} \frac{x \tan x}{\sec x + \tan x} dx =$

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33. Evaluate the definite integrals

$$\int_1^4 [|x - 1| + |x - 2| + |x - 3|] dx$$

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34. Prove the following

$$\int_0^1 x e^x dx = 1$$

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35. Prove the following

$$\int_{-1}^1 x^{17} \cos^4 x dx = 0$$

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**36.** Prove the following

$$\int_0^{\frac{\pi}{2}} \sin^3 x dx = \frac{2}{3}$$

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**37.** Prove the following

$$\int_0^{\frac{\pi}{4}} 2 \tan^3 x dx = 1 - \log 2$$

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**38.** Prove the following

$$\int_0^1 \sin^{-1} x dx = \frac{\pi}{2} - 1$$

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39. Evaluate  $\int_0^1 e^{2-3x} dx$  as a limit of a sum.



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40. Choose the correct answers

$\int \frac{dx}{e^x + e^{-x}}$  is equal to

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

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

C.  $\log(e^x - e^{-x}) + C$

D.  $\log(e^x + e^{-x}) + C$

**Answer: A**



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41. Choose the correct answers

$$\int \frac{\cos 2x}{(\sin x + \cos x)^2} dx \text{ is equal to}$$

A.  $\frac{-1}{\sin x + \cos x} + C$

B.  $\log|\sin x + \cos x| + C$

C.  $\log|\sin x - \cos x| + C$

D.  $\frac{1}{(\sin x + \cos x)^2}$

**Answer: B**



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42. If  $f(a + b - x) = f(x)$ , then  $\int_a^b x f(x) dx =$

A.  $\frac{a + b}{2} \int_a^b f(b - x) dx$

B.  $\frac{a + b}{2} \int_a^b f(b + x) dx$

$$C. \frac{b-a}{2} \int_a^b f(x) dx$$

$$D. \frac{a+b}{2} \int_a^b f(x) dx$$

**Answer: D**



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$$43. \int_0^1 \tan^{-1} \left( \frac{2x-1}{1+x-x^2} \right) dx =$$

A. 1

B. 0

C. -1

D.  $\frac{\pi}{4}$

**Answer: B**



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