

 **NCERT - Exercise - 7.1**

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

1. $\sin 2x$

SOLUTION

$$\text{Let } I = \int \sin 2x dx = -\frac{\cos 2x}{2} + C$$

2. $\cos 3x$

SOLUTION

$$\text{Let } I = \int \cos 3x dx = \frac{\sin 3x}{3} + C$$

3. e^{2x}

SOLUTION

$$\text{Let } I = \int e^{2x} dx = \frac{e^{2x}}{2} + C$$

4. $(ax+b)^2$

SOLUTION

$$\text{Let } I = \int (ax+b)^2 dx = \frac{(ax+b)^3}{3a} + C$$

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

SOLUTION

$$\text{Let } I = \int (\sin 2x - 4e^{3x}) dx = -\frac{\cos 2x}{2} - \frac{4e^{3x}}{3} + C$$

Find the following integrals in Exercises 6 to 20

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

SOLUTION

$$\text{Let } I = \int (4e^{3x} + 1) dx = \frac{4e^{3x}}{3} + x + C$$

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

SOLUTION

$$\text{Let } I = \int x^2 \left(1 - \frac{1}{x^2}\right) dx = \int (x^2 - 1) dx = \frac{x^3}{3} - x + C$$

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

SOLUTION

$$\text{Let } I = \int (ax^2 + bx + c) dx = \frac{ax^3}{3} + \frac{bx^2}{2} + cx + C$$

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

SOLUTION

$$\text{Let } I = \int (2x^2 + e^x) dx = \frac{2x^3}{3} + e^x + C$$



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

SOLUTION

Let $I = \int \left(\sqrt{x} - \frac{1}{\sqrt{x}} \right)^2 dx = \int \left(x + \frac{1}{x} - 2 \right) dx = \frac{x^2}{2} + \log x - 2x + C$

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

SOLUTION

: Let $I = \int \left(\frac{x^3 + 5x^2 - 4}{x^2} \right) dx = \int (x + 5 - 4x^{-2}) dx = \frac{x^2}{2} + 5x - \frac{4x^{-1}}{-1} + C = \frac{x^2}{2} + 5x + \frac{4}{x} + C$

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

SOLUTION

: Let $I = \int \left(\frac{x^3 + 3x + 4}{\sqrt{x}} \right) dx = \int (x^{5/2} + 3x^{1/2} + 4x^{-1/2}) dx = \frac{x^{7/2}}{7/2} + \frac{3x^{3/2}}{3/2} + \frac{4x^{1/2}}{1/2} + C = \frac{2}{7}x^{7/2} + 2x^{3/2} + 8\sqrt{x} + C$

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

SOLUTION

: Let $I = \int \left(\frac{x^3 - x^2 + x - 1}{x - 1} \right) dx = \int \frac{x^2(x - 1) + (x - 1)}{x - 1} dx = \int (x^2 + 1) dx = \frac{x^3}{3} + x + C$

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

SOLUTION

: Let $I = \int (1 - x)\sqrt{x} dx = \int (x^{1/2} - x^{3/2}) dx = \frac{x^{3/2}}{3/2} - \frac{x^{5/2}}{5/2} + C = \frac{2}{3}x^{3/2} - \frac{2}{5}x^{5/2} + C$

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

SOLUTION

Let $I = \int \sqrt{x}(3x^2 + 2x + 3) dx = \int (3x^{5/2} + 2x^{3/2} + 3x^{1/2}) dx = \frac{3x^{7/2}}{7/2} + \frac{2x^{5/2}}{5/2} + \frac{3x^{3/2}}{3/2} + C = \frac{6}{7}x^{7/2} + \frac{4}{5}x^{5/2} + 2x^{3/2} + C$

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

SOLUTION

Let $I = \int (2x - 3\cos x + e^x) dx = 2\frac{x^2}{2} - 3\sin x + e^x + C = x^2 - 3\sin x + e^x + C$

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

SOLUTION

: Let $I = \int (2x^2 - 3\sin x + 5\sqrt{x}) dx = \frac{2x^3}{3} - 3(-\cos x) + \frac{5x^{3/2}}{3/2} + C = \frac{2}{3}x^3 + 3\cos x + \frac{10}{3}x^{3/2} + C$

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

SOLUTION

: Let $I = \int \sec x(\sec x + \tan x) dx = \int (\sec^2 x + \sec x \tan x) dx = \tan x + \sec x + C$

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

SOLUTION

$\therefore \text{Let } I = \int \frac{\sec^2 x}{\cos^2 x} dx = \int \frac{1}{\cos^2 x} \cdot \sin^2 x dx = \int \tan^2 x dx = \int (\sec^2 x - 1) dx = \tan x - x + C$

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

SOLUTION

$\therefore \text{Let } I = \int \frac{2 - 3 \sin x}{\cos^2 x} dx = \int \left(\frac{2}{\cos^2 x} - 3 \frac{\sin x}{\cos^2 x} \right) dx = \int (2 \sec^2 x - 3 \sec x \tan x) dx = 2 \tan x - 3 \sec x + C$

Choose the correct answer in Exercises 21 and 22

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

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

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

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

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

SOLUTION

$\therefore \text{(C) Let } I = \int \left(\sqrt{x} + \frac{1}{\sqrt{x}} \right) dx = \int (x^{1/2} + x^{-1/2}) dx = \frac{2}{3}x^{3/2} + 2x^{1/2} + C$

22. If $\frac{d}{dx}f(x) = 4x^2 - \frac{3}{x^4}$, 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) $x^3 + \frac{1}{x^4} - \frac{129}{8}$

SOLUTION

$\therefore \text{(A) } f(x) = \int \left(4x^3 - \frac{3}{x^4} \right) dx = 4 \int x^3 dx - 3 \int x^{-4} dx = \frac{4x^4}{4} - \frac{3x^{-3}}{-3} + C = x^4 + \frac{1}{x^3} + C \therefore f(2) = (2)^4 + \frac{1}{(2)^3} + C = 0 \Rightarrow$

$C = -16 - \frac{1}{8} = -\frac{129}{8} \therefore f(x) = x^4 + \frac{1}{x^3} - \frac{129}{8}$



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