JEE Mains & Advanced Past Years Questions

JEE-MAIN PREVIOUS YEARS

1. The integral $\int \frac{2x^{12}+5x^9}{\left(x^5+x^3+1\right)^3}dx$ is equal to: where C is an arbitrary constant.

[*JEE Main - 2016*]

(a) $\frac{-x^5}{\left(x^5+x^3+1\right)^2}+C$ (b) $\frac{x^{10}}{2\left(x^5+x^3+1\right)^2}+C$

(c) $\frac{x^5}{2\left(x^5+x^3+1\right)^2}+C$ (d) $\frac{-x^{10}}{2\left(x^5+x^3+1\right)^2}+C$

2. Let $I_n=\int \tan^n x\,dx$, $(n>1)$. $I_4+I_6=a\tan^5 x+bx^5+C$, where C is a constant of integration, then the ordered pair (a, b) is equal to : [*JEE Main - 2017*]

(a) $\left(-\frac{1}{5},0\right)$ (b) $\left(-\frac{1}{5},1\right)$

(c) $\left(\frac{1}{5},0\right)$ (d) $\left(\frac{1}{5},-1\right)$

3. The integral (where C is a constant of integration)

$$\int \frac{\sin^2 x\cos^2 x}{\left(\sin^5 x+\cos^3 x\sin^2 x+\sin^3 x\cos^2 x+\cos^5 x\right)^2}dx$$

is equal to [*JEE Main - 2018*]

(a) $\frac{-1}{3\left(1+\tan^3 x\right)}+C$ (b) $\frac{1}{1+\cot^3 x}+C$

(c) $\frac{-1}{1+\cot^3 x}+C$ (d) $\frac{1}{3\left(1+\tan^3 x\right)}+C$

4. For $x^2\neq n\pi+1, n\in N$ (the set of natural numbers), the integral $\int x\cdot\sqrt{\frac{2\sin\left(x^2-1\right)-\sin 2\left(x^2-1\right)}{2\sin\left(x^2-1\right)+\sin 2\left(x^2-1\right)}}dx$ is

[*JEE Main - 2019 (January)*]

(a) $\log_e\left|\frac{1}{2}\sec^2\left(x^2-1\right)\right|+c$

(b) $\frac{1}{2}\log_e\left|\frac{1}{2}\sec^2\left(x^2-1\right)\right|+c$

(c) $\frac{1}{2}\log_e\left|\sec^2\left(\frac{x^2-1}{2}\right)\right|+c$

(d) $\log_e\left|\sec\left(\frac{x^2-1}{2}\right)\right|+c$

5. If $f(x)=\int\frac{5x^8+7x^6}{(x^2+1+2x^7)^2}\,dx\,(x\geq 0)$ and $f(0)=0$, then the valuen of $f(1)$ is: **[JEE Main - 2019 (January)]**

(a) $-\frac{1}{2}$ (b) $\frac{1}{2}$

(c) $-\frac{1}{4}$ (d) $\frac{1}{4}$

6. Let $n\geq 2$ be a natural number and $0<\theta<\pi/2$. Then $\int\frac{\left(\sin^n\theta-\sin\theta\right)^{\frac{1}{n}}\cos\theta}{\sin^{n+1}\theta}d\theta$ is equal to:
(where C is a constant of integration)
[JEE Main - 2019 (January)]

(a) $\frac{n}{n^2-1}\left(1-\frac{1}{\sin^{n-1}\theta}\right)^{\frac{n+1}{n}}+C$

(b) $\frac{n}{n^2+1}\left(1-\frac{1}{\sin^{n-1}\theta}\right)^{\frac{n+1}{n}}+C$

(c) $\frac{n}{n^2-1}\left(1+\frac{1}{\sin^{n-1}\theta}\right)^{\frac{n+1}{n}}+C$

(d) $\frac{n}{n^2-1}\left(1-\frac{1}{\sin^{n+1}\theta}\right)^{\frac{n+1}{n}}+C$

7. If $\int x^5e^{-4x^3}dx=\frac{1}{48}e^{-4x^3}f(x)+C$, is a constant of integration, then $f(x)$ is equal to :
[JEE Main - 2019 (January)]

(a) $-2x^3-1$ (b) $-4x^3-1$

(c) $-2x^3+1$ (d) $4x^3+1$

8. If $\int\frac{x+1}{\sqrt{2x-1}}dx=f(x)\sqrt{2x-1}+C$ where C is a constant of integration of integration, then $f(x)$ is equal to.
[JEE Main - 2019 (January)]

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

(c) $\frac{2}{3}(x-4)$ (d) $\frac{1}{3}(x+4)$

9. If $\int\frac{\sqrt{1-x^2}}{x^4}dx=A(x)\left(\sqrt{1-x^2}\right)^m+C$, for a suitable chosen integer m and a function $A(x)$, where C is a constant of integration, then $(A(x))^m$ equals :-
[JEE Main - 2019 (January)]

(a) $\frac{-1}{27x^9}$ (b) $\frac{-1}{3x^3}$

(c) $\frac{1}{27x^6}$ (d) $\frac{1}{9x^4}$

10. The integral $\int\cos(\log_e x)\,dx$ is equal to : (where C is a constant of integration) **[JEE Main - 2019 (January)]**

(a) $\frac{x}{2}\left[\sin\left(\log_e x\right)-\cos\left(\log_e x\right)\right]+C$

(b) $x\left[\cos\left(\log_e x\right)+\sin\left(\log_e x\right)\right]+C$

(c) $\frac{x}{2}\left[\cos\left(\log_e x\right)+\sin\left(\log_e x\right)\right]+C$

(d) $x\left[\cos\left(\log_e x\right)-\sin\left(\log_e x\right)\right]+C$

11. Let f be a differentiable function such that $f(1)=2$ and $f'(x)=f(x)$ for all $x\in R$. If $h(x)=f(f(x))$, then $h'(1)$ is equal to **[JEE Main - 2019 (January)]**

(a) $2e^2$ (b) $4e$

(c) $2e$ (d) $4e^2$

12. The integral $\int\frac{3x^{13}+2x^{11}}{\left(2x^4+3x^2+1\right)^4}dx$ is equal to (where C is a constant of integration)
[JEE Main - 2019 (January)]

(a) $\frac{x^4}{6\left(2x^4+3x^2+1\right)^3}+C$ (b) $\frac{x^{12}}{6\left(2x^4+3x^2+1\right)^3}+C$

(c) $\frac{x^4}{\left(2x^4+3x^2+1\right)^3}+C$ (d) $\frac{x^{12}}{\left(2x^4+3x^2+1\right)^3}+C$

13. If $\int\frac{dx}{x^3\left(1+x^6\right)^{2/3}}=xf(x)(1+x^6)^{1/3}+C$ where C is a constant of integration, then the function $f(x)$ is equal to :-
[JEE Main - 2019(April)]

(a) $-\frac{1}{6x^3}$ (b) $\frac{3}{x^2}$

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

14. The integral $\int\sec^{2/3}x\,\mathrm{cosec}^{4/3}x\,dx$ is equal to (Hence C is a constant of integration) **[JEE Main - 2019(April)]**

(a) $3\tan^{1/3}x+C$ (b) $-\frac{3}{4}\tan^{-4/3}x+C$

(c) $-3\cot^{1/3}x+C$ (d) $-3\tan^{-1/3}x+C$

15. If $\int e^{\sec x}(\sec x \tan x f(x) + (\sec x \tan x + \sec^2 x))dx = e^{\sec x} f(x) + C$, then a possible choice of $f(x)$ is :-

[*JEE Main - 2019(April)*]

(*a*) $\sec x \tan x - \frac{1}{2}$ (*b*) $x \sec x + \tan x + \frac{1}{2}$

(*c*) $\sec x + x \tan x - \frac{1}{2}$ (*d*) $\sec x + \tan x + \frac{1}{2}$

16. If $\int x^9 e^{x^2} dx = g(x) e^{x^2} + c$, where c is a constant of integration, then $g(-1)$ is equal to :

[*JEE Main - 2019(April)*]

(*a*) $-\frac{5}{2}$ (*b*) 1

(*c*) $-\frac{1}{2}$ (*d*) -1

17. If $\int \frac{dx}{(x^2-2x+10)^2}$

$= A\left(\tan^{-1}\left(\frac{x-1}{3}\right) + \frac{f(x)}{x^2-2x+10}\right) + C$ where C is a constant of integration, then : [*JEE Main - 2019(April)*]

(*a*) $A = \frac{1}{27}$ and $f(x) = 9(x-1)$

(*b*) $A = \frac{1}{81}$ and $f(x) = 3(x-1)$

(*c*) $A = \frac{1}{54}$ and $f(x) = 9(x-1)^2$

(*d*) $A = \frac{1}{54}$ and $f(x) = 3(x-1)$

18. The integral $\int \frac{2x^3-1}{x^4+x} dx$ is equal to:

(Here C is a constant of intergration)

[*JEE Main - 2019(April)*]

(*a*) $\log_e\left|\frac{x^3+1}{x}\right| + C$ (*b*) $\frac{1}{2}\log_e\frac{(x^3+1)^2}{|x^3|}$

(*c*) $\frac{1}{2}\log_e\frac{|x^3+1|}{x^2} + C$ (*d*) $\log_e\frac{|x^3+1|}{x^2} + C$

19. Let $\alpha \in (0, \pi/2)$ be fixed. It the integral $\int \frac{\tan x + \tan\alpha}{\tan x - \tan\alpha} dx = A(x)\cos 2\alpha + B(x)\sin 2\alpha + C$, where C is a constant of integration, then the functions A(x) and B(x) are respectively : [*JEE Main - 2019(April)*]

(*a*) $x - \alpha$ and $\log_e|\cos(x-\alpha)|$

(*b*) $x + \alpha$ and $\log_e|\sin(x-\alpha)|$

(*c*) $x - \alpha$ and $\log_e|\sin(x-\alpha)|$

(*d*) $x + \alpha$ and $\log_e|\sin(x+\alpha)|$

20. $\int \frac{\sin\frac{5x}{2}}{\sin\frac{x}{2}} dx$ is equal to : [*JEE Main-2019(April)*]

(*a*) $2x + \sin x + 2\sin 2x + c$

(*b*) $x + 2\sin x + 2\sin 2x + c$

(*c*) $x + 2\sin x + \sin 2x + c$

(*d*) $2x + \sin x + \sin 2x + c$

21. If $\int \frac{\cos x}{\sin^3 x\left(1+\sin^6 x\right)^{2/3}} dx = f(x)\left(1+\sin^6 x\right)^{1/\lambda} + c$, where c is a constant of integration, then $\lambda f\left(\frac{\pi}{3}\right)$ is equal to

[*JEE Main-2020 (January)*]

(*a*) 2 (*b*) $\frac{-9}{8}$

(*c*) $\frac{9}{8}$ (*d*) -2

22. Let $f(x) = \left(\sin(\tan^{-1}x) + \sin(\cot^{-1}x)\right)^2 - 1, |x| > 1$. If $\frac{dy}{dx} = \frac{1}{2}\frac{d}{dx}\left(\sin^{-1}(f(x))\right)$ and $y\left(\sqrt{3}\right) = \frac{\pi}{6}$, then $y\left(-\sqrt{3}\right)$ is equal to [*JEE Main-2020 (January)*]

(*a*) $\frac{\pi}{3}$ (*b*) $\frac{2\pi}{3}$

(*c*) $\frac{-\pi}{6}$ (*d*) $\frac{5\pi}{6}$

23. The integral $\int \frac{dx}{(x+4)^{8/7}(x-3)^{6/7}}$ is equal to :

[*JEE Main-2020 (January)*]

(where C is a constant of integration)

(*a*) $\left(\frac{x-3}{x+4}\right)^{1/7} + C$ (*b*) $-\frac{1}{13}\left(\frac{x-3}{x+4}\right)^{-13/7} + C$

(*c*) $\frac{1}{2}\left(\frac{x-3}{x+4}\right)^{3/7} + C$ (*d*) $-\left(\frac{x-3}{x+4}\right)^{-1/7} + C$

24. If $\int \frac{d\theta}{\cos^2\theta(\tan 2\theta + \sec 2\theta)} = \lambda\tan\theta + 2\log_e|f(\theta)| + C$ is a constant of integration, then the ordered pair $(\lambda, f(\theta))$ is equal to: [*JEE Main-2020 (January)*]

(*a*) $(1, 1+\tan\theta)$ (*b*) $(-1, 1-\tan\theta)$

(*c*) $(-1, 1+\tan\theta)$ (*d*) $(1, 1-\tan\theta)$

25. If $x^2dy + xy\,dx = x^2dy + 2y\,dx$; $y(2) = e$ and $x > 1$, then $y(4)$ is equal to: [JEE Main-2020 (September)]

(a) $\frac{\sqrt{e}}{2}$ (b) $\frac{1}{2}+\sqrt{e}$

(c) $\frac{3}{2}+\sqrt{e}$ (d) $\frac{3}{2}\sqrt{e}$

26. If $\int \sin^{-1}\left(\sqrt{\frac{x}{1+x}}\right)dx = A(x)\tan^{-1}(\sqrt{x}) + B(x) + C$, where C is a constant of integration, t hen the ordered pair (A(x) . B(x)) can be [JEE Main-2020 (September)]

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

(c) $(x-1, -\sqrt{x})$ (d) $(x-1, \sqrt{x})$

27. Let $f(x) = \int \frac{\sqrt{x}}{(1+x)^2}dx (x \geq 0)$. Then $f(3) - f(1)$ is equal to: [JEE Main-2020 (September)]

(a) $\frac{\pi}{12}+\frac{1}{2}-\frac{\sqrt{3}}{4}$ (b) $-\frac{\pi}{6}+\frac{1}{2}+\frac{\sqrt{3}}{4}$

(c) $-\frac{\pi}{12}+\frac{1}{2}+\frac{\sqrt{3}}{4}$ (d) $\frac{\pi}{6}+\frac{1}{2}-\frac{\sqrt{3}}{4}$

28. The integral $\int \left(\frac{x}{x\sin x + \cos x}\right)^2 dx$ is equal to (where C is a constant of integration): [JEE Main-2020 (September)]

(a) $\tan x - \frac{x\sec x}{x\sin x + \cos x} + C$

(b) $\sec x - \frac{x\tan x}{x\sin x + \cos x} + C$

(c) $\tan x + \frac{x\sec x}{x\sin x + \cos x} + C$

(d) $\sec x + \frac{x\tan x}{x\sin x + \cos x} + C$

29. If $\int \frac{\cos\theta}{5 + 7\sin\theta - 2\cos^2\theta}d\theta = A\log_e|B(\theta)| + C$, where C is a constant of intergation, then $\frac{B(\theta)}{A}$ can be : [JEE Main-2020 (September)]

(a) $\frac{2\sin\theta+1}{5(\sin\theta+3)}$ (b) $\frac{2\sin\theta+1}{\sin\theta+3}$

(c) $\frac{5(2\sin\theta+1)}{\sin\theta+3}$ (d) $\frac{5(\sin\theta+3)}{2\sin\theta+1}$

30. If $\int (e^{2x} + 2e^x - e^{-x} - 1)e^{(e^x+e^{-x}+1)}dx = g(x)e^{(e^x+e^{-x}+1)} + c$, where c is a constant of integration, then g (0) is equal to: [JEE Main-2020 (September)]

(a) e^2 (b) 1

(c) 2 (d) e

31. $f(x) = \int \frac{5x^8 + 7x^6}{\left(x^2 + 1 + 2x^7\right)^2}dx, (x \geq 0), f(0) = 0$ and $f(1) = \frac{1}{K}$ then the value of K is. [JEE Main-2021 (March)]

32. For real numbers α, β, γ and δ, if [JEE Main-2021 (March)]

$$\int \frac{\left(x^2-1\right) + \tan^{-1}\left(\frac{x^2+1}{x}\right)}{\left(x^4+3x^2+1\right)\tan^{-1}\left(\frac{x^2+1}{x}\right)}dx =$$

$$\alpha\log_e\left(\tan^{-1}\left(\frac{x^2+1}{x}\right)\right) + \beta\tan^{-1}\left(\frac{\gamma\left(x^2+1\right)}{x}\right) + \delta\tan^{-1}\left(\frac{x^2+1}{x}\right) + C$$

where, C is an arbitrary constant, then the value of $10(\alpha + \beta\gamma + \delta)$ is equal to. [JEE Main-2021 (March)]

JEE-ADVANCED PREVIOUS YEARS

1. The integral $\int \frac{\sec^2 x}{(\sec x + \tan x)^{9/2}}dx$ equals (for some arbitrary constant K) [JIT JEE-2012]

(a) $\frac{-1}{(\sec x + \tan x)^{11/2}}\left\{\frac{1}{11} - \frac{1}{7}(\sec x + \tan x)^2\right\} + K$

(b) $\frac{1}{(\sec x + \tan x)^{11/2}}\left\{\frac{1}{11} - \frac{1}{7}(\sec x + \tan x)^2\right\} + K$

(c) $\frac{-1}{(\sec x + \tan x)^{11/2}}\left\{\frac{1}{11} + \frac{1}{7}(\sec x + \tan x)^2\right\} + K$

(d) $\frac{1}{(\sec x + \tan x)^{11/2}}\left\{\frac{1}{11} + \frac{1}{7}(\sec x + \tan x)^2\right\} + K$

2. Let Γ denote a curve $y = y(x)$ which is in the first quadrant and let the point (1, 0) lie on it. Let the tangent to Γ at a point P intersect the y-axis at Y_p. If PY_p has length 1 for each point P on Γ, then which of the following options is/are correct ? [JEE Advanced -2019]

(a) $y = \log_e\left(\frac{1+\sqrt{1-x^2}}{x}\right) - \sqrt{1-x^2}$

(b) $xy' - \sqrt{1-x^2} = 0$

(c) $y = -\log_e\left(\frac{1+\sqrt{1-x^2}}{x}\right) + \sqrt{1-x^2}$

(d) $xy' + \sqrt{1-x^2} = 0$

JEE Mains & Advanced Past Years Questions

JEE-MAIN

PREVIOUS YEARS

1. (*b*)	**2.** (*c*)	**3.** (*a*)	**4.** (*d*)	**5.** (*d*)	**6.** (*a*)	**7.** (*b*)	**8.** (*d*)	**9.** (*a*)	**10.** (*c*)
11. (*b*)	**12.** (*b*)	**13.** (*d*)	**14.** (*d*)	**15.** (*d*)	**16.** (*a*)	**17.** (*d*)	**18.** (*a*)	**19.** (*c*)	**20.** (*c*)
21. (*d*)	**22.** (*d*)	**23.** (*a*)	**24.** (*c*)	**25.** (*d*)	**26.** (*a*)	**27.** (*a*)	**28.** (*a*)	**29.** (*c*)	**30.** (*c*)
31. (4)	**32.** (6)								

JEE-ADVANCED

PREVIOUS YEARS

1. (*c*) **2** (*a,d*)