Varun JEE Advanced (2026)

Mathematics

Integration, D.E. and Area

DPP: 1

Total Duration - 45 Min

Q1 If $I\left(m,n\right) = \int_0^1 x^{m-1}\left(1-x\right)^{n-1} dx$, then $I(9,14) + I(10,13)$ is equal to

(A) I(7, 11) (B) I(9, 13)
(C) I(11, 15) (D) I(8, 11)

Q2 The value of

$$\int_{e^2}^{e^4} \frac{1}{x}\left(\frac{e^{\left((\log_e x)^2+1\right)^{-1}}}{e^{\left((\log_e x)^2+1\right)^{-1}}+e^{\left((6-\log_e x)^2+1\right)^{-1}}}\right)dx$$ is

(A) $\log_e 2$ (B) e^2
(C) 2 (D) 1

Q3 If $I_1 = \int_0^1 x^{\frac{5}{2}}(1-x)^{\frac{7}{2}} dx$,

$I_2 = \int_0^1 \frac{x^{\frac{5}{2}}(1-x)^{\frac{7}{2}}}{(7+x)^8} dx$ and $I_1 = 7(n)^{\frac{7}{2}} \times I_2$,

where $n \in N$, then the value of n is

Q4 Let $\frac{d}{dx}\left(g(x)\right) = \frac{e^{\cos x}}{x}$, $x > 0$, $g(1) = 3a_1$, $g(2) = 6a_2$, $g(8) = 10a_3$ (where a_1, a_2, a_3 are constants) then $\int_1^2 \frac{3e^{\cos x^3}}{x} dx$ is equal to

(A) $6a_2 - 3a_1$
(B) $10a_3 - 6a_2$
(C) $10a_3 - 3a_1$
(D) $10a_3 - 6a_2 - 3a$

Q5 If $R_n = \int_0^{\pi/2} \frac{\sin^2 nx}{\sin^2 x} dx$, then which is not correct?

(A) $R_1 = \frac{\pi}{2}$
(B) $R_n = \frac{(n+1)\pi}{2}$
(C) $R_n - R_{n-1} = \frac{\pi}{2}$
(D) R_1, R_2, R_3,..... are in A.P.

Q6 The value of $\int \frac{11x-18}{x^{11}\left(\sqrt[6]{x^{12}-2x+3}\right)} dx$ is equal to

(A) $\frac{6}{5}\frac{(x^{12}-2x+3)^{\frac{5}{6}}}{x^{10}} + c$
(B) $\frac{3}{5}\frac{(x^{12}-2x+3)^{\frac{5}{6}}}{x^{10}} + c$
(C) $\frac{3}{5}\left(x^{12} - 2x + 3\right)^{\frac{5}{6}} + c$
(D) $\frac{5}{3}\frac{(x^{12}-2x+3)}{x^2} + c$

Q7 If $\int \left(\sin 3\theta + \sin\theta\right)e^{\sin\theta}\cos\theta d\theta = \left(A\sin^3\theta + B\cos^2\theta + C\sin\theta + D\cos\theta + E\right)e^{\sin\theta} + F$, then

(A) $B = 12$ (B) $D = 0$
(C) $B = -12$ (D) None of these

Q8 If $f(x)$ is a function satisfying $3f^2(x) - 4xf(x) + 2 = 0$ and the value of integral $\int \frac{(6x-2)f(x)-4x^2}{\left(3f\left(x\right)-2x\right)(x^2-f(x))^2} dx$ is equal to $\frac{ax+bf(x)}{3x^2f(x)-4x^3+2} + c$ (where a, b, c are constants), then the value of $(a+b)$ is

Q9 If $\int \frac{1+\frac{1}{2!x^2}+\frac{1}{4!x^4}+....}{x+\frac{1}{3!x}+\frac{1}{5!x^3}+....} dx = f(x) + C$ where C is integration constant.

Master NCERT with PW Books APP

Then $\left[e^{f(1)}\right]$ is equal to (where $[\cdot]$ = G I F)

Q10 $\int \frac{\sqrt{2\sin 2x+4\cos^2 x+\sin 4x}-2x}{1+\sin 2x}dx$

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

(B) $\frac{x\cos x}{\sqrt{1+\sin 2x}}+c$

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

(D) $\frac{x\sin x}{\sqrt{1+\sin 2x}}+c$

Q11 The value of

$\int e^{x^2}\left(2x-\cot x\right)\left(x^2-\ln\left(\sin x\right)\right)\left(\operatorname{cosec} x\right)dx$

is equal to

(A) $e^{x^2}\left(2x-\ln\left(\sin x\right)+1\right)\left(\operatorname{cosec} x\right)+c$

(B) $e^{x^2}\left(2x-\ln\left(\sin x\right)-1\right)\left(\operatorname{cosec} x\right)+c$

(C) $e^{x^2}\left(x^2-\ln(\sin x)+1\right)\left(\operatorname{cosec} x\right)+c$

(D) $e^{x^2}\left(x^2-\ln(\sin x)-1\right)\left(\operatorname{cosec} x\right)+c$

Q12 Let $f(x) = 7\tan^8 x + 7\tan^6 x - 3\tan^4 x - 3\tan^2 x$ for all $x\in\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$. Then the correct expression(s) is/are

(A) $\int_0^{\frac{\pi}{4}} xf\left(x\right)dx=\frac{1}{12}$

(B) $\int_0^{\pi} f\left(x\right)dx=0$

(C) $\int_0^{\frac{\pi}{4}} xf\left(x\right)dx=\frac{1}{6}$

(D) $\int_0^{\frac{\pi}{4}} f\left(x\right)dx=1$

Q13 If $A_n=\int_0^{\pi/2}\frac{\sin(2n-1)x}{\sin x}dx$,

$B_n=\int_0^{\pi/2}\left(\frac{\sin nx}{\sin x}\right)^2 dx$, for $n\in N$, then

(A) $A_{n+1}=A_n$

(B) $B_{n+1}=B_n$

(C) $A_{n+1}-A_n=B_{n+1}$

(D) $B_{n+1}-B_n=A_{n+1}$

Q14 If

$\int x^{13/2}\cdot\left(1+x^{5/2}\right)^{1/2}dx=P\left(1+x^{5/2}\right)^{7/2},$

$+Q\left(1+x^{5/2}\right)^{5/2}+R\left(1+x^{5/2}\right)^{3/2}+C$

then P, Q and R are

(A) $P=\frac{4}{35}, Q=-\frac{8}{25}, R=\frac{4}{15}$

(B) $P=\frac{4}{35}, Q=\frac{8}{25}, R=\frac{4}{15}$

(C) $P=-\frac{4}{35}, Q=-\frac{8}{25}, R=\frac{4}{15}$

(D) $P=\frac{4}{35}, Q=-\frac{8}{25}, R=-\frac{4}{15}$

Q15 Let $f(x)$ be a polynomial function of degree 2 satisfying

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

$+C,$

where C is indefinite integration constant.

Let $\int\frac{5+f(\sin x)+f(\cos x)}{\sin x+\cos x}dx=h(x)+\lambda$, where $h(1)=-1$. The value of $\tan^{-1}[h(2)]+\tan^{-1}[h(3)]$ is equal to (where λ is indefinite integration constant.)

(A) $\frac{\pi}{4}$

(B) $-\frac{\pi}{4}$

(C) $\frac{3\pi}{4}$

(D) $-\frac{3\pi}{4}$

Master NCERT with PW Books APP

Answer Key

Q1	(B)
Q2	(D)
Q3	56
Q4	(C)
Q5	(B)
Q6	(B)
Q7	(B, C)
Q8	1.00
Q9	0
Q10	(C)
Q11	(D)
Q12	(A, B)
Q13	(A, D)
Q14	(A)
Q15	(D)

Master NCERT with PW Books APP