MATHS

BOOKS - MTG WBJEE MATHS (HINGLISH)

DEFINITE INTEGRALS

Wb Jee Workout Category 1 Single Option Correct Type

1. $\int_{-\pi/2}^{\pi/2} \sin^9 x \cos^5 x dx$ equals

A. $\frac{1}{20}$

B. 20

C. 0

D. $\frac{1}{330}$

Answer: C

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2. The value of $\int_{-2}^{2}(x\cos x+\sin x+1)dx$ is

A. 2

B. 0

C. -2

D. 4

Answer: D

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3. Which of the following is the value of $\lim_{n\to\infty}\sum_{r=1}^{n}\frac{r^3}{r^4+n^4}$?

A. $\frac{1}{2}\log_e(1/2)$

B. $\frac{1}{2}\log_e(1/2)$

C. $\frac{1}{4}\log_e 2$

D. $\frac{1}{2}\log_e 2$

Answer: C

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4. The value of $\int_{\frac{\pi}{6}}^{\frac{\pi}{2}} \left(\frac{1+\sin 2x+\cos 2x}{\sin x+\cos x}\right) dx$ is equal to

A. 16

B. 8

C. 4

D. 1

Answer: D

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5. If $h(x) = \int_0^x \sin^4 t dt$, then $h(x+\pi)$ equals

A. $\frac{h(x)}{h(\pi)}$

B. $h(x).\, h(\pi)$

C. $h(x) - h(\pi)$

D. $h(x) + h(\pi)$

Answer: D

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6. $\int_\pi^{16\pi} |\sin x| dx =$

A. 0

B. 32

C. 30

D. 28

Answer: C

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7. For any value of $n \in I$, $\int_0^{\pi} e^{\cos^2 x} \cos^3[(2n+1)x]dx$ equals

A. 1

B. 2

C. -1

D. 0

Answer: D

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8. If $\int_a^b \frac{f(a+b-x)}{f(x)+f(a+b-x)}dx = 10$, then (a, b) can have the values

A. $a = 20, b = 40$

B. $a = -5, b = 5$

C. $a = 10, b = 20$

D. None of these

Answer: A

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9. $\int_0^{\pi} |\cos x| dx$

A. 2π

B. 2

C. $2/\pi$

D. π

Answer: B

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10. The value of $\int_0^{\infty} \frac{dx}{(x^2+4)(x^2+9)}$ is

A. $\frac{\pi}{60}$

B. $\frac{\pi}{20}$

C. $\frac{\pi}{40}$

D. $\frac{\pi}{80}$

Answer: A

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11. If $I_1 = \int_0^{\pi/4} \sin^2 x dx$ and $I_2 = \int_0^{\pi/4} \cos^2 x dx$, then

A. $I_1 = I_2$

B. $I_1 < I_2$

C. $I_1 > I_2$

D. $I_2 = I_1 + \pi/4$

Answer: B

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12. The value of the integral $\int_0^{\pi/4} \frac{\sin x + \cos x}{3 + \sin 2x} dx$,is

A. $\log_e 2$

B. $\log_e 3$

C. $\frac{1}{4}\log_e 2$

D. $\frac{1}{4}\log_e 3$

Answer: D

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13. $\int_{-\pi/4}^{\pi/4} \frac{e^x\left(x^3 \sin x\right)}{e^{2x}-1} dx$ equals

A. 0

B. 1

C. -1

D. e

Answer: A

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14. If $\int_0^x f(z)dz = x + \int_x^1 zf(z)$, then $\int_1^2 f(x)dx$ equals

A. $1+x$

B. $\log\left(\frac{2}{3}\right)$

C. $\log 3$

D. $\log\left(\frac{3}{2}\right)$

Answer: D

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15. If $\int_{\pi/6}^{\pi/3} \frac{\sqrt{\sin x}}{\sqrt{\cos x}+\sqrt{\sin x}}dx = \frac{k}{4}$, then value of k equals

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

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

C. $\frac{\pi}{2}$

D. None of these

Answer: B

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

A. $\frac{\pi}{2}$

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

C. $\ln 2$

D. $\frac{\pi}{2} - \ln 2$

Answer: C

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17. Let $\frac{d}{dx}(F(x)) = \frac{e^{\sin x}}{x}, x > 0$. If $\int_1^4 2\frac{e^{\sin(x^2)}}{x}dx = F(k) - F(1)$, then possible value of k is:

A. 16

B. 8

C. 0

D. -16

Answer: A

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18. $\int_{-\pi}^{5\pi} \cot^{-1}(\cot x)dx$ equals

A. $\int_{0}^{5\pi} \cot^{-1} \cot x dx$

B. $\int_{0}^{6\pi} \cot^{-1} \cot x dx$

C. $3\pi^2$

D. None of these

Answer: B

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19. If α, β are natural numbers, then $\int_{0}^{\pi/2} \cos^{\alpha} x \cos \beta x dx$ equals, provided $\alpha = \beta$

A. $\frac{\pi}{2^{\alpha+1}}$

B. $\frac{\pi}{2^{\alpha}}$

C. $\frac{\pi}{2^{\alpha-1}}$

D. None of these

Answer: A

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20. The value of the integral $\int_{-4}^{4}\left[\tan^{-1}\left(\frac{x}{x^4+1}\right)+\tan^{-1}\left(\frac{x^4+1}{x}\right)\right]dx$ equals

A. 2π

B. 3π

C. 4π

D. π

Answer: C

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21. $\int_0^{2\pi} \log\left(\frac{a+b\sec x}{a-b\sec x}\right)dx$ equals

A. $\frac{\pi(a+b)}{a-b}$

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

C. $\frac{\pi}{2}(a^2-b^2)$

D. 0

Answer: D

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22. The value of the integral $\int_0^{\pi/2} \sin^5 x dx$ is

A. $\frac{4}{15}$

B. $\frac{8}{5}$

C. $\frac{8}{15}$

D. $\frac{4}{5}$

Answer: C

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23. Evaluate the following :

$$\int_{-2}^{1} \frac{dx}{x^2 + 4x + 13}$$

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

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

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

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

Answer: D

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24. $\int_0^{\pi/4} \frac{1+\sin 2x}{\cos x+\sin x}dx$

A. 0

B. -1

C. 2

D. 1

Answer: D

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25. Evaluate the following integral: $\int_0^{\pi/2} \frac{1}{5\cos x+3\sin x}dx$

A. $\log\left(8+\sqrt{13}\right)+\log\left(8-\sqrt{34}\right)$

B. $\log\left(\frac{8+\sqrt{34}}{8-\sqrt{34}}\right)$

C. $\frac{1}{\sqrt{34}}\log\left(\frac{8+\sqrt{34}}{8-\sqrt{34}}\right)$

D. $\sqrt{34}\log\left(8+\sqrt{34}\right)$

Answer: C

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26. $\lim\ (n\to\infty)\left\{\frac{1^m+2^m+3^m+....+n^m}{n^{m+1}}\right\}$ equals

A. $\frac{1}{m+1}$

B. $\frac{1}{m}$

C. $\frac{1}{m+2}$

D. $\frac{1}{m-1}$

Answer: A

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27. If $I_1 = \int_0^{3\pi} f(\cos^2 x)\,dx$ and $I_2 = \int_0^{\pi} f(\cos^2 x)\,dx$ then (a)$I_1 = I_2$ (2) $I_1 = 2I_2$ (3) $I_1 = 5I_2$ (4) $I_1 = 3I_2$

A. $I_1 = I_2$

B. $3I_1 = I_2$

C. $I_1 = 3I_2$

D. $I_1 = 5I_2$

Answer: C

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28. $\int_0^{\sqrt{3}} \frac{x \tan^{-1} x}{(1+x^2)^{3/2}} dx$

A. $\frac{4-\pi}{4\sqrt{3}}$

B. $\frac{\pi - 4}{4\sqrt{2}}$

C. $\frac{3\sqrt{3} - \pi}{6}$

D. $\frac{4\sqrt{2}}{4 - \pi}$

Answer: C

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29. $\int_0^1 x^2 \tan^{-1} x dx$

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30. $f(x)$ is a continuous function for all real values of x and satisfies $\int_n^{n+1} f(x)dx = \frac{n^2}{2} \forall n \in I$. Then $\int_{-3}^{5} f(|x|)dx$ is equal to $\frac{19}{2}$ (b) $\frac{35}{2}$ (c) $\frac{17}{2}$ (d) none of these

A. $\frac{19}{2}$

B. $\frac{35}{2}$

C. $\frac{17}{2}$

D. None of these

Answer: B

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Wb Jee Workout Category 2 Single Option Correct Type

1. The value of $\int_{-3}^{3}(ax+bx^3+cx+k)dx$, where a,b,c,k are constants, depends only on. . . .

A. a and k

B. a and b

C. a, b and c

D. k

Answer: D

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2. If $I = \int_0^1 \frac{1}{1 + x^{\pi/2}} dx$ then

A. $\log_e 2 < I < \pi/4$

B. $\log_e 2 > I$

C. $I = \pi/4$

D. $I = \log_e 2$

Answer: A

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3. The value of the integral $\int_0^{\pi/2} \frac{1}{1 + (\tan x)^{101}} dx$ is equal to

A. 1

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

C. $\frac{\pi}{8}$

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

Answer: D

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4. The value of the integral $\int_{-2}^{2}(1+2\sin x)e^{|x|}dx$ is equal to

A. 0

B. e^2-1

C. $2\left(e^2-1\right)$

D. 1

Answer: C

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5. Let $[x]$ denote the greatest integer less than or equal to x, then the value of the integral $\int_{-1}^{1}(|x|-2[x])dx$ is equal to

A. 3

B. 2

C. -2

D. -3

Answer: A

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6. $\int_{0}^{[x]}\frac{4^x}{4^{[x]}}dx$

A. $\frac{3[x]}{2\log 2}$

B. $\frac{[x]}{\log 2}$

C. $3[x]\log 2$

D. $6[x]\log 2$

Answer: A

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7. The value of $\int_0^{\sin^2 x} \sin^{-1}\sqrt{t}dt + \int_0^{\cos^2 x} \cos^{-1}\sqrt{t}dt$ is

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

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

C. π

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

Answer: D

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8. If $\int_0^{\pi/4} \sec^2\theta \sin\theta d\theta = \int_0^{\lambda} \frac{dx}{\sqrt{x}+\sqrt{x+\lambda}}$, then $\lambda =$

A. $\frac{9}{16}$

B. $\frac{9}{25}$

C. $\frac{16}{25}$

D. $\frac{25}{16}$

Answer: A

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9. Evaluate $\int_{-4}^{-5} e^{(x+5^2)}dx + 3\int_{1/3}^{2/3} e^{9\left(x-\frac{2}{3}\right)^2}dx$

A. 0

B. e^{-1}

C. e

D. e^2

Answer: A

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10. $\lim_{x \to \infty} \int_0^x x e^{t^2 - x^2} dt$

A. 2

B. $\frac{!}{2}$

C. $-\frac{1}{2}$

D. 1

Answer: B

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11. If $\int_{-1}^{4} f(x)dx = 4$ and $\int_{2}^{4} (3 - f(x))dx = 7$, then $\int_{-1}^{2} f(x)dx =$

A. -2

B. 3

C. 4

D. 5

Answer: D

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12. $\int_{0}^{2\pi} (\sin x + |\sin x|)dx$ is equal to

A. 0

B. 1

C. 4

D. 8

Answer: C

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13. $\int_1^3 f(x)dx$, equals where $f(x) = \begin{cases} 2x+1, & \text{when } 1 \leq x \leq 2 \\ x^2+1, & \text{when } 2 < x \leq 3 \end{cases}$

A. $\frac{34}{3}$

B. $\frac{23}{3}$

C. $\frac{33}{4}$

D. $\frac{43}{3}$

Answer: A

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14. $\int_0^1 \frac{dx}{(x-a)(x-b)} =$

A. $\frac{1}{a-b}\log\left(\frac{b-ab}{a-ab}\right)$

B. $\log\left(\frac{a-ab}{b-ab}\right)$

C. $\frac{1}{2ab}\log\left(\frac{a+ab}{b+ab}\right)$

D. $\frac{1}{ab}\tan^{-1}\left(\frac{a-ab}{b-ab}\right)$

Answer: A

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Wb Jee Workout Category 3 One Or More Than One Option Correct Type

1. The value of the integral $\int_1^5 [|x-3|+|1-x|]dx$ is equal to

A. 4

B. 8

C. 12

D. 16

Answer: C

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2. The value of $\int_0^{15} [x]^3 dx$ equals, where $[.]$ denote the greatest integer function

A. 11005

B. 11025

C. 15625

D. None of these

Answer: B

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3.

$If I_1 = \int_0^1 2x, I_2 = \int_0^1 2^x \hat{} 3dx, I_3 = \int_1^{22} \hat{} x^2 dx, I_4 = \int_1^2 2^x \hat{} 3dx,$

then which of the following is/are ture? $I_1 > I_2$ (b) $I_2 > I_2$ $I_3 > I_4$ (d)

`I_3

A. $I_1 > I_2$

B. $I_1 < I_2$

C. $I_3 < I_4$

D. $I_3 = I_4$

Answer: A::C

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4. If $\int_0^\infty e^{-ax} dx = \frac{1}{a}$, then value of $\int_0^\infty x^m e^{-ax} dx$ equals

A. $\frac{(-1)^m m!}{a^{m+1}}$

B. $\frac{(-1)^m(m-1)}{a^m}$

C. $\frac{m!}{a^m}$

D. $\frac{m!}{a^{m+1}}$

Answer: D

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5. Let $f(x)$ be a function satisfying $f'(x) = f(x)$ with $f(0) = 1$ and $g(x)$ be the function satisfying $f(x) + g(x) = x^2$. Then the value of integral $\int_0^1 f(x)g(x)dx$ is equal to (A) $\frac{e-2}{4}$ (B) $\frac{e-3}{2}$ (C) $\frac{e-4}{2}$ (D) none of these

A. $\frac{e-3}{2}$

B. $\frac{e^2-3}{2}$

C. $\frac{e^2-2}{2}$

D. None of these

Answer: B

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6. $\int_0^{\infty} \frac{1}{1+x^n} dx,\ \forall n > 1$ equals

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

B. $\int_{-\infty}^{\infty} \frac{1}{1+x^n} dx$

C. $\int_1^{oio} \frac{dx}{(x^n-1)^{1/n}}$

D. $\int_0^1 \frac{1}{(1-x^n)^{1/n}} dx$

Answer: D

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7. If $f(x) = p(x)q(x),$ where $p(x) = \sqrt{\cos x}, q(x) = \log\left(\frac{(1-x)}{1+x}\right),$ then $\int_a^b f(x)dx$ equals, where $a = -1/2, b = 1/2$

A. $2\int_0^{1/2} p(x)q(x)dx$

B. $\int_0^b p(x)q(x)$

C. 1

D. 0

Answer: D

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8. $\int_0^{\pi} \frac{\cos x}{\sqrt{4+3\sin x}}dx$ is

A. rational

B. irrational

C. 0

D. $\int_{-1}^{1} x dx$

Answer: A::C::D

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9. A continuous and differentiable function f satisfies the condition, $\int_0^x f(t)dt = f^2(x) - 1$ for all real x. Then

A. f is monotonic increasing $\forall x \in R$

B. f is monotonic decreasing $\forall x \in R$

C. f is non monotonic

D. the graph of $y = f(x)$ is a straight line

Answer: A::D

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10. If $I_1 = \int_0^{\pi/4} x^{40} \sin^{10} x dx$, $I_2 = \int_0^{\pi/4} x \sin x dx$, then

A. $I_1 < I_2$

B. $I_2 = \frac{1}{\sqrt{2}}(1 - \pi/4)$

C. $I_1 > I_2$

D. $I_2 = \frac{1}{\sqrt{2}}\left(\frac{\pi}{4} - 2\right)$

Answer: A::B

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11. If $I_1 = \int_0^{\pi/4} (\tan x)^{\cos x} dx$, $I_2 = \int_0^{\pi/4} (\cot x)^{\tan x} dx$ $I_3 = \int_0^{\pi/4} (\tan x)^{\tan x} dx$, $I_4 = \int_0^{\pi/4} (\cot x)^{\cot x} dx$ then

A. $I_1 < I_3$

B. $I_2 < I_4$

C. $I_1 < I_4$

D. $I_3 < I_2$

Answer: A::B::C::D

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12. If $A = \int_0^{\pi} \frac{\sin x}{\sin x + \cos x} dx$ and $B = \int_0^{\pi} \frac{\sin x}{\sin x - \cos x} dx$, then

A. $A = B$

B. A and B both are rational

C. A and B both are irrational

D. A is period of $|\sin x|$

Answer: A::C

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13. Let the function f and g be integrable on every interval and satisfy the following conditions :

(i) f is odd, g is even function (ii) $g(x) = f(x + 5)$

Then which of the following is/are true?

A. $f(x-5)=g(x)$

B. $f(x-5)=-g(x)$

C. $\int_0^5 f(t)dt=\int_0^5 g(5-t)dt$

D. $\int_0^5 f(t)dt=-\int_0^5 g(5-t)dt$

Answer: B::C

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14. If $\int_0^{\alpha}\frac{dx}{1-\cos\alpha\cos x}=\frac{A}{\sin\alpha}+B(\alpha\neq 0)$, then possible values of A and B are

A. $A=\frac{\pi}{2}, B=0$

B. $A=\frac{\pi}{4}, B=\frac{\pi}{4\sin\alpha}$

C. $A=\frac{\pi}{6}, B=\frac{\pi}{\sin\alpha}$

D. $A=\pi, B=\frac{\pi}{\sin\alpha}$

Answer: A::B

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15. Let $f(x) = \int_0^x \frac{e^t}{t} dt (x > 0)$,

then $e^{-a}[f(x+1) - f(1+a)] =$

A. $\int_0^x \frac{e^t}{(t+a)} dt$

B. $\int_1^x \frac{e^t}{t+a} dt$

C. $e^{-a} \int_{1+a}^{x+a} \frac{e^t}{t} dt$

D. $\int_0^x \frac{e^{t-a}}{(t+a)} dt$

Answer: B::C

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16. $\int_{-1}^{1} (x - [x]) dx$ is not equivalent to

A. $\int_{-1}^{1}\{x\}dx$

B. $\int_{0}^{2}\{x\}dx$

C. $\int_{-1}^{1}[x]dx$

D. 1

Answer: C

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We Jee Previous Years Questions Category 2 Single Option Correct Type

1. The value of the integral $\int_{-1}^{1}\left\{\frac{x^{2013}}{e^{|x|}(x^2+\cos x)}+\frac{1}{e^{|x|}}\right\}dx$ is equal to

A. 0

B. $1-e^{-1}$

C. $2e^{-1}$

D. $2\left(1-e^{-1}\right)$

Answer: D

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2. The value of $I=\int_0^{\pi/4}\left(\tan^{n+1}x\right)dx+\frac{1}{2}\int_0^{\pi/2}\tan^{n-1}\left(\frac{x}{2}\right)dx$ is equal to

A. $\frac{1}{n}$

B. $\frac{n+2}{2n+1}$

C. $\frac{2n-1}{n}$

D. $\frac{2n-3}{3n-2}$

Answer: A

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3. The sum of the series $\frac{1}{1\times 2}{}^{25}C_0+\frac{1}{2\times 3}{}^{25}C_1+\frac{1}{3\times 4}{}^{25}C_2+\ldots+\frac{1}{26\times 27}{}^{25}C_{25}$ is

A. $\frac{2^{27}-1}{26\times 27}$

B. $\frac{2^{27}-28}{26\times 27}$

C. $\frac{2^{26}-1}{52}$

D. $\frac{1}{2}\left(\frac{2^{26}+1}{26\times 27}\right)$

Answer: B

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4. The value of the integral $\int_1^2 e^x\left(\log_e x+\frac{x+1}{x}\right)dx$ is

A. $e^2(1+\log_e 2)$

B. e^2-e

C. $e^2(1+\log_e 2)-e$

D. $e^2 - e(1 + \log_e 2)$

Answer: C

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5. The value of $\lim_{x \to 0} \frac{\int_0^{x^2} \cos t^2 dt}{x \sin x}$ is

A. 1

B. -1

C. 2

D. $\log_e 2$

Answer: A

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6. $2 \cdot {}^{n}C_0 + 2^2 \cdot \frac{{}^{n}C_1}{2} + 2^3 \cdot \frac{{}^{n}C_2}{3} + \ldots + 2^{n+1} \cdot \frac{{}^{n}C_n}{n+1} =$

A. $\frac{2^{n+1}-1}{n+1}$

B. $\frac{3^{n+1}-1}{n+1}$

C. $\frac{3^{n}-1}{n}$

D. $\frac{2^{n}-1}{n}$

Answer: B

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7. If $f(x) = \begin{cases} 2x^2+1, & x \leq 1 \\ 4x^3-1, & x > 1 \end{cases}$, then $\int_0^2 f(x)dx$ is

A. $47/3$

B. $50/3$

C. $1/3$

D. $47/2$

Answer: A

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8. If $I = \int_0^2 e^{x^4}(x - \alpha)dx = 0$, then α lies in the interval

A. $(0, 2)$

B. $(-1, 0)$

C. $(2, 3)$

D. $(-2, -1)$

Answer: A

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9. The value of $\lim_{x \to 2} \int_2^x \frac{3t^2}{x - 2}dt$ is

A. 10

B. 12

C. 8

D. 16

Answer: B

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10. Let f(x) denote the fractional part of a real number x. Then the value of $\int_0^{\sqrt{3}} f(x^2)\,dx$ is

A. $2\sqrt{3}-\sqrt{2}-1$

B. 0

C. $\sqrt{2}-\sqrt{3}+1$

D. $\sqrt{3}-\sqrt{2}+1$

Answer: C

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11. Let $f: R\overrightarrow{R}$ be a continuous function which satisfies $f(x) = \int_0^x f(t)dt$. Then the value of $f(1n5)$ is_____

A. 0

B. 2

C. 5

D. 3

Answer: C

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12. $\lim_{n \to \infty} \frac{\sqrt{1} + \sqrt{2} + \ldots + \sqrt{n-1}}{n\sqrt{n}} =$

A. $1/2$

B. $1/3$

C. 2//3`

D. 0

Answer: C

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13. $\int_0^1 \log\left(\frac{1}{x}-1\right)dx$ is equal to

A. 1

B. 0

C. 2

D. none of these

Answer: B

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14. Estimate the absolute value of the integral $\int_{10}^{19} \frac{\sin x}{1+x^8} dx$

A. $|I| < 10^{-9}$

B. $|I| < 10^{-7}$

C. $|I| < 10^{-5}$

D. $|I| > 10^{-7}$

Answer: B

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15. $Let I_1 = \int_0^n [x]dx$ and $I_2 = \int_0^n \{x\}dx$,where $[x]$ and $\{x\}$ are integral and fractionalparts of x and $n \in \mathbb{N} - \{1\}$. Then $\frac{I_1}{I_2}$ is equal to

A. $\frac{1}{n-1}$

B. $\frac{1}{n}$

C. n

D. $n-1$

Answer: D

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16. The value of the integral $\int_0^1 e^{x^2} dx$ lies in the integral

A. is less than 1

B. is greater than 1

C. is less tha or equal to 1

D. lies in the closed interval $[1, e]$

Answer: D

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17. $\int_0^{1000} e^{x-[x]}\,dx$

A. $\frac{e^{100}-1}{100}$

B. $\frac{e^{100}-1}{e-1}$

C. $100(e-1)$

D. $\frac{e-1}{100}$

Answer: C

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18. If $M=\int_0^{\frac{\pi}{2}} \frac{\cos x}{x+2}dx$ and $N=\int_0^{\frac{\pi}{4}} \frac{\sin x\cos x}{(x+1)^2}dx$, then the value of $M-N$ is

A. π

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

C. $\frac{2}{\pi - 4}$

D. $\frac{2}{\pi + 4}$

Answer: D

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19. The value of the integral $I = \int_{1/2014}^{2014} \frac{\tan^{-1} x}{x} dx$ is

A. $\frac{\pi}{2} \log 2014$

B. $\frac{\pi}{2} \log 2014$

C. $\pi \log 2014$

D. $\frac{1}{2} \log 2014$

Answer: B

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20. Let $I = \int_{\pi/4}^{\pi/3} \frac{\sin x}{x} dx$. Then

A. $\frac{1}{2} \leq I \leq 1$

B. $4 \leq I \leq 2\sqrt{30}$

C. $\frac{\sqrt{3}}{8} \leq I \leq \frac{\sqrt{2}}{6}$

D. $1 \leq I \leq \frac{2\sqrt{3}}{\sqrt{2}}$

Answer: C

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21. The value of $I = \int_{(\pi/2)}^{5\pi/2} \frac{e^{\tan^{-1}(\sin x)}}{e^{\tan^{-1}(\sin x)} + e^{\tan^{-1}(\cos x)}} dx$, is

A. 1

B. π

C. e

D. $\pi/2$

Answer: B

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22. The value of $\lim_{n \to \infty} \frac{1}{n}\left[\sec^2 \frac{\pi}{4n} + \sec^2 \frac{2\pi}{4n} + \ldots + \sec^2 \frac{n\pi}{4n}\right]$ is

A. $\log_e 2$

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

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

D. e

Answer: C

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23. The value of the integratio $\int_{-\pi/4}^{\pi/4} \left(\lambda|\sin x| + \frac{\mu \sin x}{1 + \cos x} + \gamma\right) dx$

A. is independent of λ only

B. is independent of μ only

C. is independent of γ only

D. depends on λ, μ and γ

Answer: B

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24. $\lim_{x \to 0} \frac{1}{x}\left[\int_{y \to a} e^{\sin^2 t} dt - \int_{x+y \to a} e^{\sin^2 t} dt\right]$ is equal to

A. $e^{\sin^2 y}$

B. $e^{2 \sin y}$

C. $e^{|\sin y|}$

D. $e^{\text{cosec } 2y}$

Answer: A

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25. The value of the integral $\int_{-1}^{1}\left\{\frac{x^{2015}}{e^{|x|}(x^2+\cos x)}+\frac{1}{e^{|x|}}\right\}dx$ is equal to

A. 0

B. $1-e^{-1}$

C. $2e^{-1}$

D. $2\left(1-e^{-1}\right)$

Answer: D

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26. Let $[a]$ denote the greatest integer which is less than or equal to a. Then the value of the integral $\int_{-\pi/2}^{\pi/2}[\sin x\cos x]dx$ is

A. $\frac{\pi}{2}$

B. π

C. $-\pi$

D. $-\frac{\pi}{2}$

Answer: D

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27. The value of the integral $\int_{\pi/6}^{\pi/2} \frac{(\sin x - x\cos x)}{x(x+\sin x)} dx$ is equal to

A. $\log_e\left(\frac{2(\pi+3)}{2\pi+3\sqrt{3}}\right)$

B. $\log_e\left(\frac{\pi+3}{2\left(2\pi+3\sqrt{3}\right)}\right)$

C. $\log_e\left(\frac{2\pi+3\sqrt{3}}{2(\pi+3)}\right)$

D. None of these

Answer: D

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28. If $[x]$ denotes the greatest integer less than or equal to x, then find the value of the integral $\int_0^2 x^2[x]dx$.

A. $\frac{5}{3}$

B. $\frac{7}{3}$

C. $\frac{8}{3}$

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

Answer: B

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29. If $f(x) = \int_{-1}^{x} |t|dt$, then for any $x \geq 0$, $f(x)$ is equal to

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

B. $1-x^2$

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

D. $1+x^2$

Answer: C

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30. Evaluate: $\int_0^{100\pi}\sqrt{(1-\cos 2x)}dx$.

A. $I=0$

B. $I=200\sqrt{2}$

C. $I=\pi\sqrt{2}$

D. $I=100$

Answer: B

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We Jee Previous Years Questions Category 3 One Or More Than One Option Correct Type

1. Let $f(x) = \begin{cases} \int_0^x |1-t|dt, & x > 1 \\ x - \frac{1}{2}, & x \leq 1 \end{cases}$ Then

A. f(x) is continuous at x = 1

B. f(x) is not continuous at x = 1

C. f(x) is differentiable at x = 1

D. f(x) is not differentiable at x = 1

Answer: A::D

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2. If $\varphi(t) = \begin{cases} 1, & \text{for } 0 \le t < 1 \\ 0, & \text{otherwise} \end{cases}$, then $\int_{-3000}^{3000} \left(\sum_{r'=2014}^{2016} \varphi(t - r')\varphi(t - 2016) \right) dt =$

A. a real number

B. 1

C. 0

D. does not exist

Answer: A::B

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3. Let f be a non constant continuous function for all $x \ge 0$. Let f satisfy the relation $f(x)f(a - x) = 1$ for some $a \in R^+$. Then $I = \int_0^a \frac{dx}{1 + f(x)}$ is equal to

A. a real number

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

C. $\frac{a}{2}$

D. $f(a)$

Answer: C

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4. Let $I = \int_0^1 \frac{x^3 \cos 3x}{2 + x^2} dx$, then

A. $-\frac{1}{2} < I < \frac{1}{2}$

B. $-\frac{1}{3} < I < \frac{1}{3}$

C. $-1 < I < 1$

D. $-\frac{3}{2} < I < \frac{3}{2}$

Answer: A::B::C::D

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5. Let $I_n = \int_0^1 x^n \tan^{-1} x dx$. If $a_n I_{n+2} + b_n I_n = c_n$ for all $n \geq 1$, then

A. a_1, a_2, a_3 are in G.P

B. b_1, b_2, b_3 are in A.P

C. c_1, c_2, c_3 are in H.P

D. a_1, a_2, a_3 are in A.P

Answer: B::D

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