MATHS

BOOKS - DISHA PUBLICATION MATHS (HINGLISH)

INTEGRALS

Jee Main 5 Years At A Glance

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

A. $\frac{-1}{3\left(1+\tan^3 x\right)} + C$

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

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

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

Answer: A

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2. The value of $\int_{-\pi/2}^{\pi/2} \frac{\sin^2 x}{1+2^x} dx$ is

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

B. 4π

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

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

Answer: C

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3. $\int \frac{\tan x}{\tan^2 x + \tan x + 1} dx = x - \frac{k}{\sqrt{A}} \tan^{-1}\left(\frac{k \tan x + 1}{\sqrt{A}}\right) + C$

, then the ordered pir of (K, A) is equal to : (A) $(2, 1)$ (B) $(-2, 3)$

(C) $(2, 3)$ (D) $(-2, 1)$

A. $(2, 3)$

B. $(2, 1)$

C. $(-2, 1)$

D. $(-2, 3)$

Answer: A

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4. If $f(x) = \int_0^x t(\sin x - \sin t)\, dt$ then :

A. $f'''(x) f'(x) = \cos x - 2x \sin x$

B. $f'''(x) + f''(x) - f'(x) = \cos x$

C. $f'''(x) - f''(x) = \cos x - 2x \sin x$

D. $f'''(x) + f''(x) = \sin x$

Answer: A

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5. The Integral $\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} \frac{dx}{1 + \cos x}$ is equal to: (2) (3) (4)

A. -1

B. -2

C. 2

D. 4

Answer: C

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6. Let $I_n = \int \tan^n x dx, (n > 1)$. If $I_4 + I_6 = a \tan^5 x + bx^5 + C$, Where C is a constant of integration, then the ordered pair (a, b) is equal to :

A. $\left(-\frac{1}{5}, 0\right)$

B. $\left(-\frac{1}{5}, 1\right)$

C. $\left(\frac{1}{5}, 0\right)$

D. $\left(\frac{1}{5}, -1\right)$

Answer: C

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7. Integral of $\sqrt{1 + 2\cot x(\cot x + \cos ecx)}$ w.r.t. x, is

A. $2\log\left|\sin\frac{x}{2}\right| + C$

B. $4\log\left|\sin\frac{x}{2}\right| + C$

C. $2\log\left|\cos\frac{x}{2}\right| + C$

D. $4\log\left|\cos\frac{x}{2}\right| + C$

Answer: A

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8. The integral $\int_{\frac{\pi}{12}}^{\frac{\pi}{4}} \frac{8\cos 2x}{(\tan x + \cot x)^3} dx$ equals

A. $\frac{15}{128}$

B. $\frac{15}{64}$

C. $\frac{13}{32}$

D. $\frac{15}{256}$

Answer: A

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9. Find a for which

$$\lim_{n \to \infty} \frac{1^a + 2^a + 3^a + \ldots + n^a}{(n+1)^{a-1}[(na+1) + (na+2) + \ldots + (na+n)]} = \frac{1}{60}$$

A. 7

B. 8

C. $\frac{15}{2}$

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

Answer: A

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10. The integral $\int \frac{2x^{12}+5x^9}{(x^5+x^3+1)^3}dx$ is equal to: (1) $\frac{-x^5}{(x^5+x^3+1)^2}+C$ (2) $\frac{x^{10}}{2(x^5+x^3+1)^2}+C$ (3) $\frac{x^5}{2(x^5+x^3+1)^2}+C$ (4) $\frac{-x^{10}}{2(x^5+x^3+1)^2}+C$ where C is an arbitrary constant.

A. $\frac{x^5}{2(x^5+x^3+1)^2}+C$

B. $\frac{x^{-10}}{2(x^5+x^3+1)^2}+C$

C. $\frac{x^{-x5}}{2(x^5+x^3+1)^2}+C$

D. $\frac{x^{10}}{2(x^5+x^3+1)^2}+C$

Answer: D

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11. $\lim_{n\to\infty}\left(\frac{(n+1)(n+2)(n+3).....3n}{n^{2n}}\right)^{\frac{1}{n}}$ is equal to

A. $\frac{9}{e^2}$

B. $3\log 3 - 2$

C. $\frac{18}{e^4}$

D. $\frac{27}{e^2}$

Answer: D

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12. If $\int \frac{dx}{\cos^3 x\sqrt{\sin 2x}} = a\left(\tan^2 x + b\right)\sqrt{\tan x} + c$

A. $\frac{16}{5}$

B. $\frac{27}{10}$

C. $\frac{7}{10}$

D. $\frac{21}{5}$

Answer: A

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13. If $2\int_0^1 \tan^{-1} x dx = \int_0^1 \cot^{-1}(1 - x + x^2) dx$ then $\int_0^1 \tan^{-1}(1 - x + x^2) dx =$

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

B. $\log 2$

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

D. $\log 4$

Answer: B

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14. The integral $\int \frac{dx}{x^2(x^4+1)^{3/4}}$ equal

A. $-(x^4+1)^{\frac{1}{4}}+c$

B. $-\left(\frac{x^4+1}{(x^2)^{\frac{1}{4}}}\right)+c$

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

D. $(x^4+1)^{\frac{1}{4}}+c$

Answer: B

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15. $\int_2^4 \frac{\log x^2}{\log x^2+\log(36-12x+x^2)dx}$ is

A. 1

B. 6

C. 2

D. 4

Answer: A

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16. $\int \frac{1}{\left((x-1)^3(x+2)^5\right)^{\frac{1}{4}}} dx$ is equal to

A. $-\frac{4}{3}\left(\frac{x+1}{x-2}\right)^{\frac{1}{4}}+C$

B. $4\left(\frac{x+1}{x-2}\right)^{\frac{1}{4}}+C$

C. $4\left(\frac{x-2}{x+1}\right)^{\frac{1}{4}}+C$

D. $-\frac{4}{3}\left(\frac{x-2}{x+1}\right)^{\frac{1}{4}}+C$

Answer: B

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17. If $f(x) = \int_1^x \frac{\log t}{1+t} dt \text{then} f(x) + f\left(\frac{1}{x}\right)$ is equal to

A. $\frac{1}{4}(\log x)^2$

B. $\log x$

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

D. $\frac{1}{4}\log x^2$

Answer: C

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18. The integral $\int\left(1+x-\frac{1}{x}\right)e^{x+\frac{1}{x}}dx$ is equal to (1) $(x-1)e^{x+\frac{1}{x}}+C$ (2) $xe^{x+\frac{1}{x}}+C$ (3) $(x+1)e^{x+\frac{1}{x}}+C$ (4) $-xe^{x+\frac{1}{x}}+C$

A. $(x+1)e^{x+\frac{1}{x}}+c$

B. $-xe^{x+\frac{1}{x}}+C$

C. $(x-1)e^{x+\frac{1}{x}}+c$

D. $xe^{x+\frac{1}{x}}+c$

Answer: D

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19. The integral $\int_0^{\pi}\sqrt{1+4\sin^2\frac{x}{2}-4\sin\frac{x}{2}}dx$ equals ,

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

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

C. $\pi-4$

D. $\frac{2\pi}{3}-4-4\sqrt{3}$

Answer: B

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20. Evaluate: $\int \frac{\sin^8 x - \cos^8 x}{1 - 2\sin^2 x + \cos^2 x} dx$

A. $\frac{1}{2}\sin 2x + c$

B. $-\frac{1}{2}\sin 2x + c$

C. $-\frac{1}{2}\sin x + c$

D. $-\sin^2 x + c$

Answer: B

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21. the integral $\int_0^{\frac{1}{2}} \frac{\ln(1+2x)}{1+4x^2} dx$ equals

A. $\frac{\pi}{4}\ln 2$

B. $\frac{\pi}{8}\ln 2$

C. $\frac{\pi}{16}\ln 2$

D. $\frac{\pi}{32}\ln 2$

Answer: C

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Exercise 1 Concept Builder

1. In the integral

$\int \frac{\cos 8x + 1}{\cot 2x - \tan 2x} dx = A\cos 8x + k,$ where k is an arbitrary constant,then A is equal to

A. $-\frac{1}{16}$

B. $\frac{1}{16}$

C. $\frac{1}{8}$

D. $-\frac{1}{8}$

Answer: A

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2. $\int \sqrt[3]{x}\sqrt[7]{1+\sqrt[3]{x^4}}$ dx is equal to

A. $\frac{21}{32}\left(1+\sqrt[3]{x^4}\right)^{8/7}+C$

B. $\frac{32}{21}\left(1+\sqrt[3]{x^4}\right)^{8/7}+C$

C. $\frac{7}{32}\left(1+\sqrt[3]{x^4}\right)^{8/7}+C$

D. None of these

Answer: A

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3. $\int \frac{x^{1/2}}{x^{1/2} - x^{1/3}} dx$ is equal to

A.

$$6\left[\frac{x}{6} + \frac{x^{\frac{5}{6}}}{5} + \frac{x^{\frac{2}{3}}}{4} + \frac{x^{\frac{1}{2}}}{3} + \frac{x^{\frac{1}{3}}}{2} + x^{\frac{1}{6}} + \log\left(x^{\frac{1}{6}} - 1\right)\right] + C$$

B.

$$6\left[\frac{x}{6} - \frac{x^{\frac{5}{6}}}{5} + \frac{x^{\frac{2}{3}}}{4} - \frac{x^{\frac{1}{2}}}{3} + \frac{x^{\frac{1}{3}}}{2} + x^{\frac{1}{6}} + \log\left(x^{\frac{1}{6}} - 1\right)\right] + C$$

C.

$$6\left[\frac{x}{6} + \frac{x^{\frac{5}{6}}}{5} - \frac{x^{\frac{2}{3}}}{4} + \frac{x^{\frac{1}{2}}}{3} - \frac{x^{\frac{1}{3}}}{2} + x^{\frac{1}{6}} + \log\left(x^{\frac{1}{6}} - 1\right)\right] + C$$

D. None of these

Answer: A

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4. The value of $\int \frac{(x^2 + 1)}{x^4 + x^2 + 1} dx$ is

A. $\frac{1}{\sqrt{3}}\tan^{-1}\left(\frac{\sqrt{3}x}{x^2-1}\right)+C$

B. $\frac{1}{\sqrt{3}}\tan^{1}\left(\frac{\sqrt{3}x}{x^2-1}\right)+C$

C. $\frac{1}{\sqrt{3}}\tan^{-1}\left(\frac{x^2+1}{\sqrt{3}x}\right)+C$

D. None of these

Answer: B

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5. If $\int\frac{1}{1+\sin x}dx=\tan\left(\frac{x}{2}+a\right)+b$ then

A. $a=-\frac{\pi}{4}, b\in R$

B. $a=\frac{\pi}{4}, b\in R$

C. $a=\frac{5\pi}{4}, b\in R$

D. None of these

Answer: A

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6. If $\int \frac{1}{\sin(x-a)\cos(x-b)} dx = A \log \left| \frac{\sin(x-a)}{\cos(x-b)} \right| + B.$ Then

A. $A = \cos(a-b), B \in R$

B. $A = \sec(a-b), B = C \in R$

C. $A = \sin(a-b), B \in R$

D. $A = \cos ec(a-b), B \in R$

Answer: B

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7. $\int \left(x + \frac{1}{x}\right)^{n+5} \left(\frac{x^2-1}{x^2}\right) dx$ is equal to:

A. $\dfrac{\left(x+\frac{1}{x}\right)^{n+6}}{n+6}+c$

B. $\left[\dfrac{x^2+1}{x^2}\right]^{n+6}(n+6)+c$

C. $\left[\dfrac{x}{x^2+1}\right]^{n+6}(n+6)+c$

D. None of these

Answer: B

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8. Evaluate: $\displaystyle\int \frac{\sin^8 x-\cos^8 x}{1-2\sin^2 x+\cos^2 x}\,dx$

A. $\dfrac{1}{2}\sin 2x+c$

B. $-\dfrac{1}{2}\sin 2x+c$

C. $-\dfrac{1}{2}\sin x+c$

D. $-\sin^2 x+c$

Answer: B

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9. If $f(x) = \ln\left(x - \sqrt{1+x^2}\right)$, then what is $\int f''(x)\,dx$ equal to ?

A. $\dfrac{1}{\left(x - \sqrt{1+x^2}\right)} + x$

B. $-\dfrac{1}{\sqrt{1+x^2}} + c$

C. $-\sqrt{1+x^2} + c$

D. $\ln\left(x - \sqrt{1+x^2}\right) + c$

Answer: B

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10. $\int \left\{ \left(\dfrac{\log x - 1}{1 + (\log x)^2} \right\}^2 dx$ is equal to

A. $\dfrac{\log x}{(\log x)^2+1}+C$

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

C. $\dfrac{xe^x}{1+x^2}+C$

D. $\dfrac{x}{(\log x)^2+1}+C$

Answer: D

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11. The primitive of the function

$f(x)=\left(1-\dfrac{1}{x^2}\right)a^{x+\frac{1}{x}}x, \ >0$, is

A. $\dfrac{a^{x+\frac{1}{x}}}{\log_e a}$

B. $(\log_e a).\, a^{x+\frac{1}{x}}$

C. $\dfrac{a^{x+\frac{1}{x}}}{x}.\log_e a$

D. $\dfrac{xa^{x+\frac{1}{x}}}{\log_e a}$

Answer: A

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12. If $\int \frac{\sin x}{\sin(x-a)} dx = Ax + B\log\sin(x-\alpha) + C,$ then the value of (A,B) , is

A. $(-\cos\alpha, \sin\alpha)$

B. $(\cos\alpha, \sin\alpha)$

C. $(-\sin\alpha, \cos\alpha)$

D. $(\sin\alpha, \cos\alpha)$

Answer: B

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13. $\int \frac{ax+b}{cx+d}\,dx$

A. $\frac{2}{7}$

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

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

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

Answer: B

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14. The value of $\int \cos(\log x)dx$ is

A. $\frac{1}{2}[\sin(\log x)+\cos(\log x)]+C$

B. $\frac{x}{2}[\sin(\log x)+\cos(\log x)]+C$

C. $\frac{x}{2}[\sin(\log x)-\cos(\log x)]+C$

D. $\frac{1}{2}[\sin(\log x) - \cos(\log x)] + C$

Answer: B

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15. $\int \frac{x^2 \tan^{-1}(x^3)}{1 + x^6} dx$

A. $\tan^{-1} x^3 + C$

B. $\frac{1}{6}(\tan^{-1} x^3) + C$

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

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

Answer: B

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16. Evaluate the following Integrals.

$$\int \frac{dx}{4\sin^2 x + 4\sin x \cos x + 5\cos^2 x}$$

A. $\frac{-1}{22}\tan^{-1}\left(\frac{2\tan x + 1}{2}\right) + C$

B. $\frac{1}{22}\tan^{-1}\left(\frac{2\tan x + 1}{2}\right) + C$

C. $\frac{1}{22}\tan^{-1}\left(\frac{\tan x + 2}{2}\right) + C$

D. None of these

Answer: B

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17. Value of $\int \frac{x^2 + 1}{(x-1)(x-2)} dx$ is

A. $x + \log\left[\frac{(x-2)^5}{(x-1)^2}\right] + C$

B. $x + \log\left[\frac{(x-1)^2}{(x-2)^5}\right] + C$

C. $x - \log\left[\frac{(x-1)^5}{(x-1)^1}\right] + C$

D. None of these

Answer: A

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18. $\int \frac{1-\cos x}{\cos x(1+\cos x)} dx$

A. $\log|\sec x + \tan x| - 2\tan\frac{x}{2} + C$

B. $\log|\sec x - \tan x| + C$

C. $\log\left|\tan\frac{x}{2}\right| + \sec x + C$

D. $\log|\sec x + \tan x| - 2\tan x + C$

Answer: A

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19. $\int \frac{e^x + e^{-x}}{(e^x - e^{-x})\log \sin hx} dx =$

A. 0

B. 1

C. 2

D. 5

Answer: B

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20. Evaluate: $\int \frac{x^3 + x}{x^4 - 9} dx$

A. $\frac{1}{4}|x^4 - 9| + \frac{1}{12}\log\left|\frac{x^2 + 3}{x^2 - 3}\right| + C$

B. $\frac{1}{4}|x^4 - 9| - \frac{1}{12}\log\left|\frac{x^2 - 3}{x^2 + 3}\right| + C$

C. $\frac{1}{4}|x^4 - 9| + \frac{1}{12}\log\left|\frac{x^2 - 3}{x^2 + 3}\right| + C$

D. None of these

Answer: option 4

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21. $\int \frac{dx}{\sin x(3\cos^2 x)}$ is equal to

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22. $\int \frac{x^2-1}{(x^2+1)\sqrt{x^4+1}}$ dx is equal to -

A. $\sec^{-1}\left(\frac{x^2+1}{\sqrt{2}x}\right)+c$

B. $\frac{1}{\sqrt{2}}\sec^{-1}\left(\frac{x^2+1}{\sqrt{2}x}\right)+c$

C. $\frac{1}{\sqrt{2}}\sec^{-1}\left(\frac{x^2+1}{\sqrt{2}x}\right)+c$

D. None of these

Answer: B

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23. $\int \frac{x^3}{(x^2+1)(x^2+4)} dx$ is equal to

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

B. $\tan^{-1}\left(\frac{x}{2}\right) - 4\tan^{-1} x + C$

C. $-\frac{1}{2}\tan^{-1} x + \frac{2}{3}\tan^{-1}\left(\frac{x}{2}\right) + C$

D. $4\tan^{-1}\left(\frac{x}{2}\right) - 2\tan^{-1} x + C$

Answer: C

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

A. $-\cot(ex^x) + C$

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

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

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

Answer: B

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25. If $\int \frac{3x+4}{x^3-2x-4}\,dx = \log|x-2| + k\log f(x) + c,$ then (i) $f(x) = |x^2+2x+2|$ (ii) $f(x) = x^2+2x+2$ (iii) $k = \frac{1}{2}$ (iv) $k = -\frac{1}{4}$

A. $f(x) = |x^2+2x+2|$

B. $f(x) = x^2+2x+2$

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

D. All of these

Answer: D

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26. $\int (27e^{9x} + e^{12x})^{1/3} dx$ is equal to

A. $(1/4)(27 + e^{3x})^{1/2} + C$

B. $(1/4)(27 + e^{3x})^{2/3} + C$

C. $(1/3)(27 + e^{3x})^{4/3} + C$

D. $(1/4)(27 + e^{3x})^{4/3} + C$

Answer: D

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27. Evaluate: $\int \frac{\sin x}{\sin 4x} dx$

A. $\frac{1}{4}\log\left|\frac{\sin x - 1}{\sin x + 1}\right| - \frac{1}{\sqrt{2}}\log\left|\frac{\sqrt{2}\sin x - 1}{\sqrt{2}\sin x + 1}\right| + C$

B. $\frac{1}{8}\log\left|\frac{\sin x - 1}{\sin x + 1}\right| - \frac{1}{2\sqrt{2}}\log\left|\frac{\sqrt{2}\sin x - 1}{\sqrt{2}\sin x + 1}\right| + C$

C. $\frac{1}{8}\log\left|\frac{\sin x - 1}{\sin x + 1}\right| - \frac{1}{4\sqrt{2}}\log\left|\frac{\sqrt{2}\sin x - 1}{\sqrt{2}\sin x + 1}\right| + C$

D. None of these

Answer: C

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28. $\int \frac{1}{x^2(x^4+1)^{3/4}} dx$ is equal to

A. $\left(1 + \frac{1}{x^4}\right)^{1/4} + C$

B. $(x^2+1)^{1/4} + C$

C. $\left(1 - \frac{1}{x^4}\right)^{1/4} + C$

D. $-\left(1+\frac{1}{x^4}\right)^{1/4}+C$

Answer: D

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29. $\int \sin 2x.\log\cos x dx is$ equal to

A. $\cos^2 x\left(\frac{1}{2}+\log\cos x\right)+k$

B. $\cos^2 x.\log\cos x+k$

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

D. None of these

Answer: C

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30. If $\int \frac{e^x(1+\sin x)dx}{1+\cos x} = e^x f(x) + C,$ then f (x) is equal to

A. $\sin \frac{x}{2}$

B. $\cos \frac{x}{2}$

C. $\tan \frac{x}{2}$

D. $\log \frac{x}{2}$

Answer: C

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31. If $a_n = \int_0^{\frac{\pi}{2}} \frac{\sin^2 nx}{\sin x} dx$ then

$a_2 - a_1, a_3 - a_2, a_4 - a_3, \ldots\ldots$ are in

A. A.P.

B. G.P.

C. H.P.

D. None of these

Answer: A

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32. Let $I = \int_0^1 \frac{\sin x}{\sqrt{x}} dx$ and $I = \int_0^1 \frac{\cos x}{\sqrt{x}} \int dx.$

Then, which one of the following is true?

A. $K < 2/3$ and $J < 2$

B. $K > 2/3$ and $J > 2$

C. $K < 2/3$ and $J > 2$

D. $K > 2/3$ and $J < 2$

Answer: A

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33. $\int_{-\pi/2}^{\pi/2} \frac{|x|}{8\cos^2 2x + 1} dx$ has the value

A. $\frac{\pi^2}{6}$

B. $\frac{\pi^2}{12}$

C. $\frac{\pi^2}{24}$

D. None of these

Answer: B

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34. If $\int_0^1 e^{x^2}(x - \alpha)dx = 0$ then

A. $1 < \alpha < 2$

B. $\alpha < 0$

C. $0 < \alpha < 2$

D. $\alpha = 0$

Answer: A

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35. The value of the integral $\int_0^{\pi} \cos 2x \log_e \sin x dx$ is

A. 0

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

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

D. $-\pi$

Answer: B

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36. If $\int_{\frac{1}{2}}^{2} \frac{1}{x} \cos ec^{101}\left(x - \frac{1}{x}\right) dx = k$ then the value of k is :

A. $1/4$

B. 1

C. 0

D. $101/2$

Answer: C

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37. The value of $\int_{-\pi}^{\pi} \frac{\cos^2 x}{1 + a^x} . dx$,a>0 is

A. π

B. $a\pi$

C. $\pi/2$

D. 2π

Answer: C

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38. The value of $\int_1^{e^{37}} \frac{\pi \sin(\pi \log x)}{x} dx$ is .....

A. 2

B. 20

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

D. 2π

Answer: A

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39. Evaluate $\int_0^{\pi} \frac{x}{1+\cos^2 x} dx.$

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

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

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

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

Answer: B

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40. The value of $\int_{\pi/4}^{3\pi/4} \frac{\phi}{1+\sin\phi} d\phi$ is

A. $\sqrt{2}-1$

B. $\frac{1}{\sqrt{2}-1}$

C. $\frac{\pi}{\sqrt{2}+1}$

D. $\frac{\pi}{\sqrt{2}-1}$

Answer: A

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41. The value of $\int_0^1 \frac{dx}{e^x+e}$ is equal to

A. $\frac{1}{e}\log\left(\frac{1+e}{2}\right)$

B. $\log\left(\frac{1+e}{2}\right)$

C. $\frac{1}{e}\log(1+e)$

D. $\log\left(\frac{2}{1+e}\right)$

Answer: B

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42. The value of $\int_{-1}^{3}(|x|+|x-1|)dx$ is equal to

A. 4

B. 9

C. 2

D. $\frac{9}{2}$

Answer: C

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43. The value of $\int_{-\pi}^{\pi}\frac{\sin^2 x}{1+7^x}dx =$ is equal to

A. 7^{π}

B. π

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

D. 2^{π}

Answer: D

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44. $\int_{\log 1/2}^{\log 2} \sin\left\{\frac{e^x - 1}{e^x + 1}\right\} dx$ equals

A. $\cos \frac{1}{3}$

B. $\sin \frac{1}{2}$

C. $\cos 2$

D. 0

Answer: B

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45. Let $f(x) = x^2 - 2. If \int_3^6 f(x)dx = 3f(c)$ for some $c \in (3, 6)$ then the value of c is equal to

A. $\sqrt{12}$

B. $\sqrt{21}$

C. $\sqrt{19}$

D. $\sqrt{17}$

Answer: B

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46. $\int_0^\pi x\left(\sin^4 x \cos^4 x\right)dx$

A. $\frac{3\pi^2}{64}$

B. $\frac{3\pi^2}{128}$

C. $\frac{3\pi^2}{256}$

D. None of these

Answer: A

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47. If $I_n = \int_0^{\pi/4} \tan^n \theta \quad d\theta$, then $I_8 + I_6 =$

A. 1

B. -1

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

D. None of these

Answer: B

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48. $I_n = \int_0^{\pi/4} \tan^n x \, dx$, then $\lim_{n \to \infty} n\left[I_n + I_{n+2}\right]$ is equal to (i) $\frac{1}{2}$ (ii)1 (iii)∞ (iv) 0

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

B. 1

C. ∞

D. zero

Answer: B

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49. What is $\int \tan^2 x \sec^4 x dx$ equal to ?

A. $\frac{\sec^5 x}{5} + \frac{\sec^3 x}{3} + x$

B. $\frac{\tan^5 x}{5} + \frac{\tan^3 x}{3} + c$

C. $\frac{\tan^5 x}{5} + \frac{\sec^3 x}{3} + c$

D. $\frac{\sec^5 x}{5} + \frac{\tan^3 x}{3} + c$

Answer: B

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50. $\int_0^{\pi/2} \sin^2 x \cos^3 x dx$

A. 0

B. $\frac{2}{15}$

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

D. None of these

Answer: C

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51. If $\int_0^\infty e^{-ax}dx = \frac{1}{a}$, then $\int_0^\infty (x^n)e^{-ax}dx$ is

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

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

C. $\frac{n!}{a^{n+1}}$

D. None of these

Answer: B

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52. If $I_{m,n} = \int_0^1 x^m (\ln x)^n$dx then $I_{m,n}$ is also equal to

A. $\frac{m}{n} f(m-1, n)$

B. $-\frac{m}{n} f(m-1, n)$

C. $\frac{n}{m} f(m-1, n)$

D. None of these

Answer: D

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53. What is the limiting value of the expression

$\frac{\{(n+1)(n+2)\ldots\ldots(2n)\}^{\frac{1}{n}}}{n}$ when n tends to infinity ?

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

B. e

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

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

Answer: D

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54. $\left(\sum_{n=1}^{10}\int_{-2n-1}^{-2n}\sin^{27}(x)dx+\sum_{n=1}^{10}\int_{2n}^{2n+1}\sin^{27}(x)dx\right)$

A. 27^2

B. -54

C. 54

D. 0

Answer: A

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55. The limit, when the tends to infinity, of the series

$\frac{\sqrt{n}}{\sqrt{n^3}}+\frac{\sqrt{n}}{\sqrt{[n+4(n-1)]^3}}$ is

A. $\frac{5-\sqrt{5}}{10}$

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

C. $5+\sqrt{5}$

D. $2+\sqrt{2}$

Answer: B

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56. The series $1+\frac{1}{2}+\frac{1}{3}+\ldots\ldots+\frac{1}{n}$ can be expressed by the definite integral

A. $\int_0^{\frac{\pi}{2}} \tan\left(\frac{\theta}{2}\right)(1-\cos^n\theta)d\theta$

B. $\int_0^{\frac{\pi}{2}} \cot\left(\frac{\theta}{2}\right)(1-\cos^n\theta)d\theta$

C. $\int_0^{\frac{\pi}{4}} \cot\left(\frac{\theta}{2}\right)(1+\cos^n\theta)d\theta$

D. $\int_0^{\frac{\pi}{4}} \tan\left(\frac{\theta}{2}\right)(1+\cos^n\theta)d\theta$

Answer: C

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57. $\lim_{n->\infty}\left\{\frac{1}{2n+1}+\frac{1}{2n+2}+\ldots\ldots\frac{1}{2n+n}\right\}$ is equal to

A. $\log_e \frac{1}{3}$

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

C. $\log_e \frac{3}{2}$

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

Answer: B

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58. Evaluate: $\int(1+2x+3x^2+4x^3+)dx, (<|x|<1)$

A. $(1+x)^{-1+c}$

B. $(1-x)^{-1}+c$

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

D. None of these

Answer: B

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59. If

$$S_n = \frac{1}{2n} + \frac{1}{\sqrt{4n^2-1}} + \frac{1}{\sqrt{4n^2-4}} + + \frac{1}{\sqrt{3n^2+2n-1}}, n \in N,$$

then $(\lim)_{n \to \infty} S_n$ is equal to $\frac{\pi}{2}$ (b) 2 (c) 1 (d) $\frac{\pi}{6}$

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

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

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

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

Answer: B

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Exercise 2 Concept Applicator

1. The value of the limit

$$\lim_{n \to \infty} \left[\frac{1}{na} + \frac{1}{na+1} + \frac{1}{na+2} + \ldots\ldots + \frac{1}{nb} \right] \text{ is}$$

A. $\frac{b}{a}$

B. $\log \frac{b}{a}$

C. $e^{b \backslash a}$

D. None of these

Answer: B

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2. Let the equation of a curve passing through the point (0,1) be given b $y = \int x^2 e^{x^3} dx$. If the equation of the curve is written in the form $x = f(y)$, then f(y) is

A. $\sqrt{\log_e(3y-2)}$

B. $\sqrt[3]{\log_e(3y(-2))}$

C. $3\sqrt{\log_e(2-3y)}$

D. None of these

Answer: B

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3. If $\int f(x)\sin x \cos x dx = \frac{1}{2(b^2-a^2)}\log f(x) + C$, then $f(x)$ is

A. $a^2 \sin^2 x + b^2 \cos^2 x + C$

B. $a^2 \sin^2 x - b^2 \cos^2 x + C$

C. $a^2 \cos^2 x + b^2 \sin^2 x + C$

D. $a^2 \cos^2 x - b^2 \sin^2 x + C$

Answer: A

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4. If $\int \sqrt{2}\sqrt{1+\sin x}dx = -4\cos(ax+b)+C$ then the value of (a,b) is :

A. $\left(\frac{1}{2}, \frac{\pi}{4}\right)$

B. $\left(1, \frac{\pi}{2}\right)$

C. $(1, 1)$

D. None of these

Answer: A

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5. Evaluate: $\int \frac{1}{1+3\sin^2 x+8\cos^2 x}\,dx$

A. $\frac{1}{6}\tan^{-1}(2\tan x)+C$

B. $\tan^{-1}(2\tan x)+C$

C. $\frac{1}{6}\tan^{-1}\left(\frac{2\tan x}{3}\right)+C$

D. None of these

Answer: C

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6. $I=\int\left\{\log_e \log_e x+\frac{1}{(\log_e x)^2}\right\}dx$ is equal to:

A. $x\log_e \log_e x+C$

B. $x \log_e \log_e x - \frac{x}{\log_e x} + C$

C. $x \log_e \log_e x + \frac{x}{\log_e x} + C$

D. None of these

Answer: B

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7. $\int \frac{\sqrt{x}}{1+4\sqrt{x^3}} dx$ is equal to

A. $\frac{4}{3}\left[1+x^{3/4}+\log\left(1+x^{3/4}\right)\right]+C$

B. $\frac{4}{3}\left[1+x^{3/4}-\log\left(1+x^{3/4}\right)\right]+C$

C. $\frac{4}{3}p1-x^{3/4}-\log\left(1+x^{3/4}\right)\Big]+C$

D. None of these

Answer: B

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8. In the integral

$\int \frac{\cos 8x + 1}{\cot 2x - \tan 2x} dx = A \cos 8x + k,$ where k is an arbitrary constant,then A is equal to

A. $-\frac{1}{16}$

B. $\frac{1}{16}$

C. $\frac{1}{8}$

D. $-\frac{1}{8}$

Answer: A

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9. If $|x| < 1$ thn $\underset{n \to \infty}{\text{Lt}} (1+x)(1+x^2)(1+x^4)....(1+x^{2n}) =$

A. $\log_e\left(\frac{x}{1-x}\right)+c$

B. $-\log_e\left(\frac{x}{1-x}\right)+\frac{\log_e x}{1-x}+c$

C. $\frac{\log_e x}{1-x}+\log_e(1-x)+c$

D. $x\log_e x+\log_e(1-x)+c$

Answer: B

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

A. $e^{1000}-1$

B. $\frac{e^{1000}-1}{e-1}$

C. $1000(e-1)$

D. $\frac{e-1}{1000}$

Answer: C

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11. Evaluate: if $\int f(x)dx = g(x), then \int f^{-1}(x)dx$

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

B. $f\left(g^{-1}(x)\right) + C$

C. $xf^{-1}(x) - g\left(f^{-1}(x)\right) + C$

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

Answer: C

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12. $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \frac{e^{\theta}(\theta \sin \theta)}{e^{2\theta} - 1} d\theta =$

A. 3

B. 2

C. 1

D. 0

Answer: D

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13. $\int \frac{x^{n-1}}{x^{2n}+a^2}dx =$

A. $\frac{1}{na}\tan^{-1}\left(\frac{x^n}{a}\right)+C$

B. $\frac{n}{a}\tan^{-1}\left(\frac{x^n}{a}\right)+C$

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

D. $\frac{n}{a}\cos^{-1}\left(\frac{x^n}{a}\right)+C$

Answer: A

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14. If $\int f(x)\cos x dx = \frac{1}{2}f^2(x) + C$, then $f(x)$ can be

A. x

B. 1

C. $\cos x$

D. $\sin x$

Answer: D

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15. Evaluate: $\int 2^2 \hat{} \ x 2^2 \hat{} \ x dx.$

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

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

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

D. $\frac{1}{(\log 2)^4} 2^{2^{2^x}} + C$

Answer: A

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16. The value of $\int_{\sqrt{\log 2}}^{\sqrt{\log 3}} \frac{x \sin x^2}{\sin x^2 + \sin(\log 6 - x^2)} dx$ is

A. $\frac{1}{4} \ln \frac{3}{2}$

B. $\frac{1}{2} \ln \frac{3}{2}$

C. $\ln \frac{3}{2}$

D. $\frac{1}{6} \ln \frac{3}{2}$

Answer: A

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17. The value of $\int \frac{(1+x)}{x(1+xe^x)^2} dx$, is equal to

A. $\log\left|\frac{xe^x}{1+xe^x}\right| + \frac{1}{1+xe^x} + c$

B. $(1+xe^x) + \log\left|\frac{xe^x}{1+xe^x}\right| + c$

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

D. None of these

Answer: A

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18. The value of $\int \frac{(ax^2-b)dx}{x\sqrt{c^2x^2-(ax^2+b)^2}}$ is equal to

A. $\sin^{-1}\left(\frac{(ax+b/x)}{c}\right)+K$

B. $\sin^{-1}\left(\frac{(ax^2+b/x^2)}{x}\right)+K$

C. $\sin^{-1}\left(\frac{(ax+b/x)}{x}\right)+K$

D. $\cos^{-1}\left(\frac{(ax^2+b/x^2)}{x}\right)+K$

Answer: A

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19. $\int_{\log\sqrt{\pi/2}}^{\log\sqrt{\pi}} e^{2x}\sec^2\left(\frac{1}{3}e^{2x}\right)dx =$

A. $\sqrt{3}$

B. $\frac{1}{\sqrt{3}}$

C. $\frac{3\sqrt{3}}{2}$

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

Answer: A

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20. Evaluate : $\int \frac{6x+7}{\sqrt{(x-5)(x-4)}}\,dx$

A. $6, 34$

B. $3, 9$

C. $12, 17$

D. None of these

Answer: A

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21. Evaluate: $\int \frac{x}{(x-1)(x^2+4)}dx$

A. $\frac{1}{5}\log|x-1| - \frac{1}{10}\log(x^2+4) + \frac{2}{5}\tan^{-1}\left(\frac{x}{2}\right) + C$

B. $\frac{2}{5}\log|x-1| + \log(x^2+4) - \tan^{-1}\left(\frac{x}{2}\right) + C$

C. $\frac{4}{5}(\log \mid x-1) + \log(x^2+4) - 2\tan^{-1}\left(\frac{x}{2}\right) + C$

D. None of these

Answer: A

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22. $\int \frac{\sqrt{5+x^2}}{x^4}\,dx =$

A. $\frac{1}{15}\left(1+\frac{5}{x^2}\right)^{\frac{3}{2}} + C$

B. $\frac{-1}{15}\left(1+\frac{1}{x^2}\right)^{\frac{3}{2}} + C$

C. $\frac{-1}{15}\left(1+\frac{5}{x^2}\right)^{\frac{3}{2}} + C$

D. $\frac{1}{15}\left(1+\frac{1}{x^2}\right)^{\frac{3}{2}} + C$

Answer: C

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23. If $f(x) = pe^{2x} + qe^{x} + rx$ satisfies the condition $f(0) = -1, f'(In2) = 31$ and $\int_0^{In4} (f(x) - rx)dx = \frac{39}{2}$, then the value of $(p + q + r)$ is equal to

A. $P = 2, Q = -3, R = 4$

B. $P = -5, Q = 2, R = 3$

C. $P = 5, Q = -2, R = 3$

D. $P = 5, Q = -6, R = 3$

Answer: D

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24. 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. π

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

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

D. 1

Answer: C

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25. Find $\int_0^{\pi/2} \cos^3 x$

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26. What is $\int_0^{\pi/2} \frac{dx}{a^2\cos^2 x + b^2\sin^2 x}$ equal to ?

A. 2ab

B. $2\pi ab$

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

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

Answer: C

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27. Let $f: R \to R$ be a differentiable function and $f(1) = 4$. Then, the value of $\lim_{x \to 1} \int_4^{f(x)} \frac{2t}{x-1} dt$ is :

A. 16

B. 8

C. 4

D. 2

Answer: A

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28. Let $F(x) = f(x) + f\left(\frac{1}{x}\right)$, where $f(x) = \int_1^x \frac{\log t}{1+t} dt$. Then F (e) equals

A. 1

B. 2

C. 43832

D. 0

Answer: C

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29. $\int_a^b \frac{|x|}{x} dx$

A. $b - a$

B. $|b| - |a|$

C. $a + b$

D. $|a| + |b|$

Answer: B

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30. What is $\int \tan^2 x \sec^4 x dx$ equal to ?

A. $\frac{\sec^5 x}{5} + \frac{\sec^3 x}{3} + c$

B. $\frac{\tan^5 x}{5} + \frac{\tan^3 x}{3} + c$

C. $\frac{\tan^5 x}{5} + \frac{\sec^3 x}{3} + c$

D. $\frac{\sec^5 x}{5} + \frac{\tan^3 x}{3} + c$

Answer: B

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31. Evaluate $\int f(x)\log_e x dx$ equal to if $f(x) = x^2$

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