MATHS

BOOKS - SAI MATHS (TELUGU ENGLISH)

INDEFINITE INTEGRATION

Problems

1. If

$$\int \frac{x+5}{x^2+4x+5}dx = a\log\left(x^2+4x+5\right) + b\tan^{-1}(x+k)$$

+ constant then (a,b,c)=

A. $\left(\frac{1}{2}, 3, 2\right)$

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

C. $\left(\frac{1}{2}, 3, 1\right)$

D. (1,3,2)

Answer: A

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2. Evaluate the integerals.

$\int \sqrt{e^x - 4} dx on [\log_e 4, \infty].$

A. $\tan^{-1}\left(\frac{\sqrt{e^x - 4}}{2}\right) + \sqrt{e^x - 4 + e}$

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

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

D. $\sqrt{e^x - 4} - 4\tan^{-1}(e^x - 4) + e$

Answer: B

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3.

$$\int e^{-x}\tan^{-1}(e^x)dx = f(x) - \frac{1}{2}\log\left(1+e^{2x}\right) + c \Rightarrow f(x) =$$

A. $e^x - e^{-x}\tan^{-1}(e^x)$

B. $x^2 + e^{-x}\tan^{-1}e^x$

C. $-e^{-x}\tan^{-1}(e^x)$

D. $x - e^{-x}\tan^{-1}(e^x)$

Answer: D

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4. $\int\left(\sqrt{\frac{2+x}{2-x}}\right)dx =$

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

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

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

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

Answer: D

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5. $\int\frac{dx}{(x-1)\sqrt{x^2-1}} =$

A. $-\frac{\sqrt{x+1}}{x-1}+c$

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

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

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

Answer: C

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6. $\int \frac{e^x\left(x^2+1\right)}{(1+x)^2}dx =$

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

B. $-\frac{e^x}{x-1}+c$

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

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

Answer: C

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7. $\int \frac{(x+1)dx}{x(1+xe^x)} =$

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

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

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

D. $\log(1+xe^x) + c$

Answer: B

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8. $\int \frac{f(x)g'(x) - f'(x)g(x)}{f(x)g(x)}[\log(g(x)) - \log(f(x))]dx =$

A. $\frac{\log(g(x))}{f(x)} + c$

B. $\frac{1}{2}\left[\frac{\log(g(x))}{f(x)}\right]^2 + c$

C. $\frac{g(x)}{f(x)}\frac{\log(g(x))}{f(x)} + c$

D. $\log\left|\frac{g(x)}{f(x)}\right| - \frac{g(x)}{f(x)} + c$

Answer: B

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9. $\int \frac{dx}{\sqrt{\sin^3 x \cos x}} = g(x) + c \Rightarrow g(x) =$

A. $-\frac{2}{\sqrt{\cot x}}$

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

C. $\frac{2}{\sqrt{\cot x}}$

D. $\frac{2}{\sqrt{\tan x}}$

Answer: B

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10. If $\int \frac{dx}{(1+\sqrt{x})\sqrt{x-x^2}} = \frac{A\sqrt{x}}{\sqrt{1-x}} + \frac{B}{\sqrt{1-x}} + C,$ where C is a real constant then $A + B =$

A. 3

B. 0

C. 1

D. 2

Answer: B

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11. For any integer $n \geq 2$, let $I_n = \int \tan^n x dx$. If $I_n = \frac{1}{a}\tan^{n-1} x - bI_{n-2}$ for $n \geq 2$, then the ordered pair (a,b) equals to

A. $\left(n-1, \frac{n-1}{n-2}\right)$

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

C. (n,1)

D. (n-1,1)

Answer: D

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12. If

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

in which c is a constant then A =

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

B. 3

C. 2

D. 1

Answer: C

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13. $\int e^x\left(\frac{2+\sin 2x}{1+\cos 2x}dx = \right.$

A. $e^x \cot x + c$

B. $2e^x \sec^2 x + c$

C. $e^x \cos 2x + c$

D. $e^x \tan x + c$

Answer: D

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14.

$$\int \frac{x - \sin x}{1 + \cos x} dx = \tan\left(\frac{x}{2}\right) + p \log\left|\sec\left(\frac{x}{2}\right)\right| + c \Rightarrow p =$$

A. -4

B. 4

C. 2

D. -2

Answer: A

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15. $\int \frac{dx}{x(\log x - 2)(\log x - 3)} = I + c \Rightarrow I =$

A. $\frac{1}{x}\log\left|\frac{\log x - 3}{\log x - 2}\right|$

B. $\log\left|\frac{\log x - 3}{\log x - 2}\right|$

C. $\log\left|\frac{\log x - 2}{\log x - 3}\right|$

D. $\log|(\log x - 3)(\log x - 2)|$

Answer: B

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16. $\int \frac{dx}{x^2\sqrt{4+x^2}} =$

A. $\frac{1}{4}\sqrt{4+x^2}+c$

B. $-\frac{1}{4}\sqrt{4+x^2}+c$

C. $-\frac{1}{4x}\sqrt{4+x^2}+c$

D. $-\frac{9}{4x}\sqrt{4+x^2}+c$

Answer: C

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17. If $\int \sec^2 x \operatorname{cosec}^4 x dx = -\frac{1}{3}\cos^3 x + k\tan x - 2\cot x + c,$ then k is equal to

A. 4

B. 3

C. 2

D. 1

Answer: D

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18. $\int \frac{dx}{\sqrt{x - x^2}} =$

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

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

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

D. $\sin^{-1}\sqrt{x}+c$

Answer: A

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19. $\int\left(\sqrt{\frac{a+x}{a-x}}\right)+\sqrt{\frac{a-x}{a+x}}dx$ is equal to

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

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

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

D. $2\cos^{-1}\left(\frac{x}{a}\right)+c$

Answer: B

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20. If $\int \frac{\sin^8 x - \cos^8 x}{1 - 2\sin^2 \cos^2 x} dx = A \sin 2x + B$, then A=

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

B. -1

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

D. 1

Answer: A

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21. $\int \frac{1 + \cos 4x}{\cot x - \tan x} dx =$

A. $-\frac{1}{4}\cos 4x + c$

B. $\frac{1}{8}\cos 4x + c$

C. $\frac{1}{4}\sin 4x + c$

D. $-\frac{1}{8}\cos 4x + c$

Answer: D

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22. $\int \frac{7x^8 + 8x^7}{(1 + x + x^8)^2} dx = f(x) + c \Rightarrow f(x) =$

A. $\frac{x^8}{1 + x + x^8}$

B. $28\log\left(1 + x + x^8\right)$

C. $\frac{1}{1 + x + x^8}$

D. $-\frac{1}{1 + x + x^8}$

Answer: A

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23. If $f_n(x) = \log \log \ldots . \log x (\log$ is repeated n-times), then $\int (x f_1(x) f_2(x) \ldots . f_n(x))^{-1}$ dx is equal to,

A. $f_{n+1}(x) + c$

B. $\frac{f_{a+1}(x)}{n+1} + c$

C. $n f_n(x) + c$

D. $\frac{f_n(x)}{n} + c$

Answer: A

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24. $\int(1-\cos x)\text{cosec}^2 x dx = f(x)+c \Rightarrow f(x) =$

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

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

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

D. $\frac{1}{2}\frac{\tan x}{2}$

Answer: A

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25. $\int \frac{dx}{(x+1)\sqrt{4x+3}} =$

A. $\tan^{-1}\sqrt{4x+3}+c$

B. $3\tan^{-1}\sqrt{4x+3}+c$

C. $2\tan^{-1}\sqrt{4x+3}+c$

D. $4\tan^{-1}\sqrt{4x+3}+c$

Answer: C

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26. $\int \frac{2-\sin 2x}{1-\cos 2x}e^x$ dx is equal to

A. $-e^x\cot x+c$

B. $e^x\cot x+c$

C. $2e^x\cot x+c$

D. $-2e^x\cot x+c$

Answer: A

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27. If $I_n = \int (\sin^n) dx$, then $nI_n - (n-1)I_{n-1}$ equals to

A. $\sin^{n-1} x \cos x$

B. $\cos^{n-1} x \sin x$

C. $-\sin^{n-1} x \cos x$

D. $-\cos^{n-1} x \sin x$

Answer: C

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

A. $e^x \cot\left(\frac{x}{2}\right) + c$

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

C. $-e^x \cot\left(\frac{x}{2}\right) + c$

D. $-e^x \cot\left(\frac{x}{2}\right) + c$

Answer: C

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29. If $I_n = \int x^n e^{cx} dx$ for $n \geq 1$, then c, $I_n + nI_{n-1}$ is equal to

A. $x^n e^{cx}$

B. x^n

C. e^{cx}

D. $x^n + e^{cx}$

Answer: A

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30. If $\int e^x(1+x)\sec^2(xe^x)dx = f(x)$ + constant, then f(x) is equal to

A. $\cos(xe^x)$

B. $\sin(xe^x)$

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

D. $\tan(xe^x)$

Answer: C

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31. If $\int \frac{e^x - 1}{e^x + 1} dx = f(x) + c$, then f(x) is equal to

A. $2\log(e^x + 1)$

B. $\log\left(e^{2x} - 1\right)$

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

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

Answer: A

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32. $\int \tan^{-1}\left(\sqrt{\frac{1-x}{1+x}}\right) dx$ is equal to

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

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

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

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

Answer: A

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33. $\int\frac{\sin x+8\cos x}{4\sin x+6\cos x}dx$ is equal to

A. $x+\frac{1}{2}\log(4\sin x+6\cos x)+c$

B. $2x+\log(2\sin x+3\cos x)+c$

C. $x+2\log(2\sin x+3\cos x)+c$

D. $\frac{1}{2}\log(4\sin x+6\cos x)+c$

Answer: A

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34. Assertion (A) $\frac{x^2-1}{x^2}\frac{e^{x^2+1}}{x}dx = \frac{e^{x^2+1}}{x} + c$

Reason (R) $\int f'(x)e^{f(x)}\,dx = f(x) + c$

A. Both A and R are true and R is the correct explanation of A

B. Both A and B are true and R is not the correct explanatiion of A

C. A is true but R is false

D. A is false but R is true

Answer: C

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35. If $\int \sqrt{\frac{x}{a^3 - x^3}} dx = g(x) + c$, then g(x) is equal to

A. $\frac{2}{3}\cos^{-1} x$

B. $\frac{2}{3}\sin^{-1}\left(\frac{x^3}{a^3}\right)$

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

D. $\frac{2}{3}\cos^{-1}\left(\frac{x}{a}\right)$

Answer: C

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36. If $\int \frac{dx}{x^2 + 2x + 2} = f(x) + c$, then f(x) is equal to

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

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

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

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

Answer: A

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37. If $\int \frac{\sin x}{\cos x(1+\cos x)} dx = f(x)$+c, then f(x) is equal to

A. $\left|\frac{1-\cos x}{\cos x}\right|$

B. $\log\left|\frac{\cos x}{1+\cos x}\right|$

C. $\left|\frac{\sin x}{1+\sin x}\right|$

D. $\log\left|\frac{1+\sin x}{\sin x}\right|$

Answer: A

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38. If $\int\left(x^{49}\frac{\tan^{-1}\left(x^{50}\right)}{1+x^{100}}\right)dx = k\left(\tan^{-1}\left(x^{50}\right)^2+c\right)$, then k is equal to

A. $\frac{1}{50}$

B. $-\frac{1}{50}$

C. $\frac{1}{100}$

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

Answer: C

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39. If $\int \frac{\sin^{-1}(2x)}{1+x^2} dx = f(x) - \log(1+x^2) + c$, then f(x) is equal to

A. $2x \tan^{-1} x$

B. $-2x \tan^{-1} x$

C. $x \tan^{-1} x$

D. $-x \tan^{-1} x$

Answer: A

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40. $\int \frac{dx}{(x+100)\sqrt{x+99}} = f(x) + c \Rightarrow f(x) =$

A. $2(x+100)^{1/2}$

B. $3(x+100)^{1/2}$

C. $2\tan^{-1}\left(\sqrt{x+99}\right)$

D. $2\tan^{-1}\left(\sqrt{x+100}\right)$

Answer: C

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41. $\int \frac{3-x^2}{1-2x+x^2} e^x dx = e^x f(x) + c \Rightarrow f(x) =$

A. $\frac{1+x}{1-x}$

B. $\frac{1-x}{1+x}$

C. $\frac{1+x}{x-1}$

D. $\frac{x-1}{1+x}$

Answer: D

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42. $\int \frac{\sqrt{\cot x}}{\sin x \cos x} dx = -f(x) + c \Rightarrow f(x) =$

A. $2\sqrt{\tan x}$

B. $-2\sqrt{\tan x}$

C. $-2\sqrt{\cot x}$

D. $2\sqrt{\cot x}$

Answer: D

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43. $\int\left(\frac{(1+x)+\sqrt{x}\cdot\sqrt{1+x}}{\sqrt{x}+\sqrt{1+x}}\right)\Big)$ dx is equal to

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

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

C. $\sqrt{1+x}+c$

D. $2(1+x)^{3/2}+c$

Answer: B

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44. The integral $\int\left(1+x-\frac{1}{x}\right)e^{x+1/x}dx$ is equal to

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

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

C. $-xe^{x+x^{-1}}+c$

D. $xe^{x+x^{-1}}+c$

Answer: D

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45. $\int \frac{dx}{1-\cos x-\sin x}$ is equal to

A. $\log\left|1+\cot\left(\frac{x}{2}\right)\right|+c$

B. $\log\left|1-\tan\left(\frac{x}{2}\right)\right|+c$

C. $\log\left|1-\cot\left(\frac{x}{2}\right)\right|+c$

D. $\log\left|1+\tan\left(\frac{x}{2}\right)\right|+c$

Answer: C

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46. $\int \frac{dx}{7+5\cos x}$ is equal to

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

B. $\frac{1}{\sqrt{6}}\tan^{-1}\left(\frac{\tan\left(\frac{x}{2}\right)}{\sqrt{6}}\right)+c$

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

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

Answer: B

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47. $\int \frac{3^x dx}{\sqrt{9^x - 1}}$ is equal to

A. $\frac{1}{\log 3} \log \left| 3^x + \sqrt{9^x - 1} \right| + c$

B. $\frac{1}{\log 3} \log \left| 3^x - \sqrt{9^x - 1} \right| + c$

C. $\frac{1}{\log 9} \log \left| 3^x - \sqrt{9^x - 1} \right| + c$

D. $\frac{1}{\log 3} \log \left| 9^x + \sqrt{9^x - 1} \right| + c$

Answer: A

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48. $\int \frac{dx}{\sqrt{x}(x+9)}$ is equal to

A. $\frac{2}{3} \tan^{-1} \sqrt{x} + c$

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

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

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

Answer: B

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49. $\int(x+1)^2 e^x dx =$

A. $x_e^x + c$

B. $x^2 x^v + c$

C. $(x+1)e^x + c$

D. $\left(x^2+1\right)e^x + c$

Answer: D

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50. Evaluate the integerals.

$$\int \frac{dx}{a^2 \sin^2 x + b^2 \cos^2 x} on R, a \neq 0, b \neq 0.$$

A. $\frac{1}{ab} \frac{\tan^{-1}(a \tan x)}{b} + c$

B. $\frac{\tan^{-1}(a \tan x)}{b} + c$

C. $\frac{1}{ab} \frac{\tan^{-1}(b \tan x)}{a} + c$

D. $\frac{\tan^{-1}(b \tan x)}{a} + c$

Answer: A

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