



MATHS

BOOKS - SAI MATHS (TELUGU ENGLISH)

INDEFINITE INTEGRATION

Problems

1.

If

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

+ 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 integrals.

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

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.

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

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

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

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

Answer: C

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

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

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

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

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

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

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

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

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

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

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

Answer: A

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

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

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

C. $n f_n(x) + c$

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

Answer: A

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

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 $\int e^x(1+x)\sec^2(xe^x)dx = f(x) + \text{constant}$, 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. $\log(e^{2x} - 1)$

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

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

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 explanation 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 $\int \left(x^{49} \frac{\tan^{-1}(x^{50})}{1 + x^{100}} \right) dx = k \left(\tan^{-1}(x^{50})^2 + c \right)$, 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. $2 \tan^{-1}(\sqrt{x + 99})$

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

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. $\int \left(\frac{(1+x) + \sqrt{x} \cdot \sqrt{1+x}}{\sqrt{x} + \sqrt{1+x}} \right) dx$ 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. $\frac{1}{\log 3} \log |3^x + \sqrt{9^x - 1}| + c$

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

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

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

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. $(x^2 + 1)e^x + c$

Answer: D

50. Evaluate the integrals.

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

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