WHY DID THE e^X FUNCTIONS FAIL TO INTEGRATE INTO A COMMUNITY OF LN(X) FUNCTIONS?

Match each indefinite integral with an anti-derivative.

1) $\int e^x dx$ D	2) $2\int e^x dx$ E	3) $\frac{1}{2}\int e^x dx$ A	4) $\int e^{2x} dx$ C	5) $3\int e^{3x} dx$ G
6) $\int 2^x dx$ T	7) $\int 3^x dx$ Y	8) $3\int 2^x dx$ U	9) $\int 2^{3x} dx$ W	10) E $\int 2^x \ln 2\, dx =$
11) $\int e^{2x+1} dx$ L	12) $\int e^{3x+1} dx$ H	13) $\int \frac{e^x+1}{e^x} dx$ N	14) $\int (e^x-1)(e^{-x}+1) dx$ O	

$\ln 2 \int 2^x dx = \ln 2 \frac{2^x}{\ln 2}$

Anti-derivatives.

A. $\frac{1}{2}e^x + C$	C. $\frac{1}{2}e^{2x} + C$	D. $e^x + C$	E. $2e^x + C$	G. $e^{3x} + C$
E. $2^x + C$	L. $\frac{1}{2}e^{2x+1} + C$	H. $\frac{1}{3}e^{3x+1} + C$	N. $x - e^{-x} + C$	O. $e^x + e^{-x} + C$
S. $e^x - e^{-x} + C$	T. $\frac{2^x}{\ln 2} + C$	U. $\frac{3 \cdot 2^x}{\ln 2} + C$	W. $\frac{2^{3x}}{3\ln 2} + C$	Y. $\frac{3^x}{\ln 3} + C$

T'	H	E	Y		W	O	U	L	D	N	'	T		C	H	A	N	G	E
6	12	10	7		9	14	8	11	1	13		6		4	12	3	13	5	2

WHY IS $\int \frac{d(\text{CABIN})}{\text{CABIN}}$ LIKE A HOUSEBOAT?

Match each indefinite integral with an anti-derivative.

1) $\int \frac{dx}{x}$ C	2) $\int \frac{2dx}{x}$ B	3) $\int \frac{dx}{2x}$ A	4) $\int \frac{dx}{x^2}$ $\frac{x^{-1}}{-1}$ G	5) $\int \frac{dx}{x^3}$ $\frac{x^{-2}}{-2}$ E
6) $\int \frac{dx}{x-1}$ I	7) $\int \frac{dx}{1-x}$ L	8) $\int \frac{2dx}{3x-1}$ P	9) $\int \frac{3dx}{2x-1}$ S	
10) $\int \frac{x+1}{x} dx$ O	11) $\int \frac{x^2-1}{x} dx$ N	12) $\int \frac{x+1}{x^2} dx$ U	13) $\int (x-1)(x^{-1}+1) dx$ N	

Anti-Derivatives.

A. $\frac{1}{2}\ln\lvert x\rvert + C$	B. $2\ln\lvert x\rvert + C$	C. $\ln\lvert x\rvert + C$	E. $-\frac{1}{2}x^{-2} + C$	G. $-x^{-1} + C$
I. $\ln\lvert x-1\rvert + C$	L. $-\ln\lvert 1-x\rvert + C$	N. $\frac{1}{2}x^2 - \ln\lvert x\rvert + C$	O. $x + \ln\lvert x\rvert + C$	
P. $\frac{2}{3}\ln\lvert 3x-1\rvert + C$	S. $\frac{3}{2}\ln\lvert 2x-1\rvert + C$	T. $\ln\lvert 1-x\rvert + C$	U. $\ln\lvert x\rvert - \frac{1}{x} + C$	

L	N	(	C	A	B	I	N	) +	C
7	13		1	3	2	6	13		1

L	O	G		C	A	B	I	N		P	L	U	S		S	E	A
7	10	4		1	3	2	6	11		8	7	12	9		9	5	3

Top

51

4) let $u = 2x$ $\quad \frac{1}{2}\int e^u \, du \quad \frac{1}{2}e^{2x} + C$

$\frac{du}{dx} = 2$

$\frac{du}{2} = dx$

5) let $u = 3x$ $\quad 3 \cdot \frac{1}{3}\int e^u \, du = e^{3x} + C$

$\frac{du}{dx} = 3$

$\frac{du}{3} = dx$

9) let $u = 3x$ $\quad \frac{1}{3}\int 2^u \, du = \frac{1}{3} \cdot \frac{2^{3x}}{\ln 2} + C$

$\frac{du}{dx} = 3$

$\frac{du}{3} = dx$

11) let $u = 2x+1$ $\quad \frac{1}{2}\int e^u \, du = \frac{1}{2}e^{2x+1} + C$

$\frac{du}{dx} = 2$

$\frac{du}{2} = dx$

12) let $u = 3x+1$ $\quad \frac{1}{3}\int e^u \, du = \frac{1}{3}e^{3x+1} + C$

$\frac{du}{dx} = 3$

$\frac{du}{3} = dx$

13) $\cancel{u = e^x + 1}$ $\quad \int \frac{e^x+1}{e^x} dx = \int (1 + e^{-x}) dx$ $\quad$ let $u = -x$

$\frac{du}{dx} = e^x$ $\qquad \frac{du}{dx} = -1$

$\frac{du}{e^x} = dx$ $\quad \int e^{-x}(e^x+1) dx$ $\quad \int 1 dx + \int e^{-x} dx$ $\quad -du = +dx$

$x + -\int e^u \, du$

$x - e^u + C = x - e^{-x} + C$

14) $\int (e^0 - e^{-x} + e^x - 1) \, dx$

$\int (e^x - e^{-x}) dx = \int e^x dx - \int e^{-x} dx$ $\quad -du$

$e^x + e^{-x} + C$

$u = -x$

$\frac{du}{dx} = -1$

$du = -dx$

Bottom

51

6) $u = x-1$ $\int \frac{1}{u}du$

$\frac{du}{dx} = 1$ $\ln|x-1| + C$

$du = dx$

8) $u = 3x+1$ $\frac{2}{3}\ln|3x+1| + C$

$\frac{du}{dx} = 3$

$\frac{1}{3}du = dx$

9) $u = 2x-1$ $\frac{3}{2}\ln|2x-1| + C$

$\frac{1}{2}du = dx$

10) $\int \left(1 + \frac{1}{x}\right) dx$

$x + \ln x + C$

11) $\int \left(x - \frac{1}{x}\right) dx$

$\frac{1}{2}x^2 - \ln x + C$

12) $\int \left(\frac{1}{x} + \frac{1}{x^2}\right) dx$

x^{-2}

$\ln x - x^{-1} + C$

13) $\int \left(\cancel{x^0} - \frac{1}{x} + x - \cancel{1}\right) dx$

$-\ln|x| + \frac{1}{2}x^2 + C$

IF U = $\frac{1}{2}$(LOOP)^2, THEN DU = (?).

Choose a function to substitute for u.

1) $\int 2x(x^2+1)^5 dx$	2) $\int \frac{2x}{x^2+1} dx$	3) $\int 2x\sqrt{x^2+1}\,dx$	4) $\int 3x^2(x^3+1)^5 dx$
5) $\int \sin^3(x)\cos(x)dx$	6) $\int \frac{\cos(x)}{\sin(x)} dx$	7) $-\int \sin(x)e^{\cos(x)}dx$	8) $-\int \frac{\sin(x)}{\cos^2(x)} dx$
	9) $\int \tan^3(x)\sec^2(x)dx$	10) $\int \cos(x)\sqrt{1+\sin(x)}\,dx$	

Let u = (?).

A. $u = \sin^3(x)$	D. $u = 1+\sin(x)$	L. $u = \cos(x)$	M. $u = x^2$	O. $u = x^2+1$
P. $u = \sin(x)$	R. $u = \tan^3(x)$	S. $u = e^x$	(. $u = \tan(x)$	). $u = x^3+1$

L	O	O	P
8	1	1	6

D	(	L	O	O	P	)
10	9	7	2	3	5	4

WHAT POLITICAL MOVEMENT AIMS TO PREVENT THE TEACHING OF CALCULUS IN HIGH SCHOOLS?

For the indefinite integrals 1) – 10) above, 1a) – 10a) du= (?):

A. $du = 3x^2dx$	B. $du = \tan(x)dx$	E. $du = 2xdx$	I. $du = -\sin(x)dx$
K. $du = \sec(x)dx$	M. $du = \sec^2(x)dx$	P. $du = \sin(x)dx$	R. $du = \tan^3(x)dx$
S. $du = e^xdx$	T. $du = \cos(x)dx$	U. $du = -\cos(x)dx$	V. $du = (x^3+1)dx$

For the indefinite integrals 1) – 10) above, 1b) – 10b) give the indefinite integral.

A. $\frac{1}{6}(x^2+1)^6 + k$	D. $\frac{1}{6}(x^3+1)^6 + k$	E. $\frac{2}{3}(x^2+1)^{3/2} + k$	H. $\frac{1}{4}\sin^4(x) + k$
M. $\frac{1}{4}\tan^4(x) + k$	N. $-\sec(x) + k$	O. $e^{\cos(x)} + k$	P. $\sec(x) + k$
P. $\sec^3(x) + k$	R. $\frac{2}{3}(\sin x+1)^{3/2} + k$	T. $\ln(x^2+1) + k$	V. $\ln\lvert\sin(x)\rvert + k$

T	H	E
5a	5b	1a

A	N	T	I
4a	8b	10a	7a

-

D	E	R	I	V	A	T	I	V	E
4b	3a	10b	8a	6b	1b	2b	8a	6b	1a

M	O	V	E	M	E	N	T
9a	7b	6b	2a	9b	3b	8b	6a

52

$u = x^2+1$ $\quad$ $u = x^3+1$ $\quad$ $u = \sin x$

$\frac{du}{dx} = 2x$ $\quad$ $\frac{du}{\cancel{dx}} = 3x^2\,dx$ $\quad$ $du = \cos x\,dx$

$du = 2x\,dx$

$u = \cos x$ $\quad$ $u = \tan x$ $\quad$ $u = 1+\sin x$

$du = -\sin x\,dx$ $\quad$ $du = \sec^2 x\,dx$ $\quad$ $du = \cos x\,dx$

1) $\int u^5\,du$ $\quad$ 2) $\int \frac{1}{u}\,du$ $\quad$ 3) $\int \sqrt{u}\,du = \int u^{1/2}\,du$

$\ln u + k$

$\frac{1}{6}u^6 + C$ $\quad$ $\ln|x^2+1| + k$ $\quad$ $\frac{2}{3}u^{3/2} + k = \frac{2}{3}(x^2+1)^{1/2} + k$

$\frac{1}{6}(x^2+1)^6 + C$

4) $\int u^5\,du$ $\quad$ 5) $\int u^3\,du$ $\quad$ 6) $\int \frac{1}{u}\,du$

$\frac{1}{6}u^6 + C$ $\quad$ $\frac{1}{4}u^4 + C$ $\quad$ $\ln u + C$

$\frac{1}{6}(x^3+1)^6 + C$ $\quad$ $\frac{1}{4}(\sin^4(x) + C$ $\quad$ $\ln|\sin x| + C$

7) $+\int e^u\,du$ $\quad$ 8) $+\int \frac{1}{u^2}\,du$ $\quad$ 9) $\int u^3\,du$

$e^u + C$ $\quad$ $-u^{-1} + C$ $\quad$ $\frac{1}{4}u^4 + C$

$e^{\cos x} + C$ $\quad$ $-\cos^{-1}x + C$ $\quad$ $\frac{1}{4}\tan^4 x + C$

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

$-\sec x + C$ $\quad$ 10) $\int \sqrt{u}\,du$

$\frac{2}{3}u^{3/2} + k$

$\frac{2}{3}(1+\sin x)^{3/2} + C$