

< ⇒ < G7< OOL FOI N8 ON9



You will have $\int_0^1 x^n dx$ to evaluate each of the fifteen definite integrals that will be displayed one at a time on this screen. $\int_0^1 x^n dx$ At the end of the two minutes, all hands must go up and judges will grade your answers immediately. For each correct answer, you will receive one raffle ticket to be entered for prizes that will be drawn after dinner.

At most five participants will move to the Finals – to be determined by the total number of correct answers and tiebreaking criteria if necessary. $\int_0^1 x^n dx$

≠NH9; F5L #%

≠NH9; F5L #%

$$\int_0^2 (2 \sin x + 3 \cos x) dx$$

NH9; F5L #%

$$\int_0^2 (2 \sin x + 3 \cos x) dx$$
$$= \left[-2 \cos x \right]$$

≠NH9; F5L #&

F958Y,

; 9HG9H...

&\$\$

& \$ % (I of G = NH9; F5H = ON 699

≠NH9; F5L #&

$$\int_1^2 x^2 \left(x - \frac{1}{x} \right) dx$$

≠NH9; F5L #&

$$\int_1^2 x^2 \left(x - \frac{1}{x} \right) dx$$

$$= \int_1^2 (x^3 - x) dx$$

$$= \left[\frac{x^4}{4} - \frac{x^2}{2} \right]_1^2$$

$$= \frac{9}{4}$$

NIP F5I #1

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; 9HG9H...

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≠NH9; F5L #'

$$\int_{-1}^1 \sqrt[3]{\frac{x+1}{2}} dx$$

NH9; F5L #'

$$\int_{-1}^1 \sqrt[3]{\frac{x+1}{2}} dx$$

$$= 2 \int_0^1 \sqrt[3]{u} du \quad \left[u = \frac{x+1}{2}; \quad du = \frac{1}{2} dx \right]$$

$$= 2 \left[\frac{3u^{4/3}}{4} \right]_0^1$$

$$= \frac{3}{2}$$

≠NH9; F5L #(

F958Y,

; 9HG9H...

& \$\$

& \$ %(I of G =NH9; F5H=ON 699

≠NH9; F5L #()

$$\int_0^4 \tan^2 x \sec^2 x \, dx = 4 \tan^2 0$$

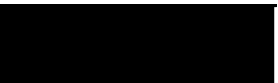
NH9; F5L #()

$$\int_0^{\pi/4} \tan^2 x \sec^2 x \, dx$$

$$= \int_0^1 u^2 \, du \quad [u = \tan x; \quad du = \sec^2 x \, dx]$$

$$= \left[\frac{u^3}{3} \right]_0^1$$

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



≠NH₉⁺; F

19; F5L #)

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$$\int_1^2 \frac{3x^4 + 5x^2 + 2}{x^2} dx$$

$$= \int_1^2 \left(\frac{3x^4}{x^2} + \frac{5x^2}{x^2} \right)$$

≠NH9; F5L #*

F958Y,

; 9HG9H...

& \$\$

& \$ % (I of G = NH9; F5H = ON 699

≠NH9; F5L #*

$$\int_{-1}^0 (x + 2)(x^2 + 4x + 3)^2 dx$$

$\neq \text{NH9;}$

$$\int_{-1}^0 (x + 2) \sqrt{x^2 + 4x + 4} \, dx$$

$$[u = x^2 + 4x + 4 \quad du = 2x + 4 \, dx = 2(x + 2) \, dx]$$

$$= \frac{1}{2} \int_0^3 u^{\frac{1}{2}} \, du$$

$$= \frac{1}{2} \left[\frac{2}{3} u^{\frac{3}{2}} \right]_0^3 = \frac{1}{2} \cdot \frac{2}{3} \cdot \frac{3\sqrt{3}}{2} = \frac{\sqrt{3}}{2}$$

≠NH; F5L #+

F958Y,

; 9HG9H...

& \$\$

≠NH9; F5L #+

$$\int_{2=}^{3=} \frac{1}{x^2} \sin \frac{1}{x} dx$$

NH9; F5L #+

$$\int_{2=}^{3=} \frac{1}{x^2} \sin \frac{1}{x} dx$$

$$= - \int_{=2}^{=3} \sin u du \quad \left[u = \frac{1}{x}; \quad du = -\frac{1}{x^2} dx \right]$$

$$= \left[\cos u \right]_{=2}^{=3}$$

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NH; F5L #,

F958Y,

; 9HG9H...

& \$\$

& \$ % (I of G = NH9; F5H = ON 699

≠NH9; F5L #,

$$\int_1^9 \frac{(1 - \sqrt{x})^3}{\sqrt{x}}$$

≠NH9; F5L #,

$$\int_1^9 \frac{(1 - \sqrt{x})^3}{\sqrt{x}} dx$$

$$= -2 \int_0^{-2} u^3 du \quad \left[u = 1 - \sqrt{x}; \quad du = -\frac{1}{2\sqrt{x}} dx \right]$$

$$= -2 \left[\frac{u^4}{4} \right]_0^{-2}$$

$$= \boxed{-8}$$

NH; F5L #-

F958Y,

; 9HG9H...

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& \$ % (I of G = NH9; F5H = ON 699

NH9; F5L #

$$\int_0^{\pi/2} \cos x \sqrt{1 + \sin x} dx$$

NH9; F5L #

$$\int_0^{\pi/2} \cos x \sqrt{1 + \sin x} \, dx$$

$$= \int_1^2 \sqrt{u} \, du \quad [u = 1 + \sin x; \quad du = \cos x \, dx]$$

$$= \left[\frac{2u^{3/2}}{3} \right]_1^2$$

$$= \frac{2}{3}$$

≠NH9; F5L #%

F958Y,

; 9HG9H...

& \$\$

& \$ % (I of G = NH9; F5H = ON 699

∓NH9; F5L #%\$

$$\int_0^1 x e^x dx$$

\$ % (I of G = NH9; F 5 H

∓NH9; F5L #%\$

$$\int_0^1 x e^x dx$$

$$\left[\begin{array}{l} \text{integrate by parts:} \\ u = x \\ du = dx \end{array} ; \begin{array}{l} dv = e^x dx \\ v = e^x \end{array} \right]$$

$$= \left[x e^x \right]_0^1 - \int_0^1 e^x dx$$

$$= e - \left[e^x \right]_0^1 = \boxed{1}$$

≠NH9; F5L #%%

≠NH9; F5L #%%

$$\int_0^1 \left(\sqrt{x^3} + \sqrt[3]{x^2} + \sqrt[4]{x} \right) dx$$

≠NH9; F5L #%%

$$\int_0^1 \left(\sqrt{x^3} + \sqrt[3]{x^2} + \sqrt[4]{x} \right) dx$$

$$= \int_0^1 \left(x^{3=2} + x^{2=3} + x^{1=4} \right) dx$$

$$= \left[\frac{2x^{5=2}}{5} + \frac{3x^{5=3}}{5} + \frac{4x^{5=4}}{5} \right]_0^1$$

$$= \frac{9}{5}$$

≠NH9; F5L #%&

F958Y,

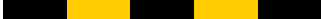
; 9HG9H...

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& \$ % (I of G = NH9; F5H = ON 699

≠NH9; F5L #%&

$$\int_0^{\pi/3} \frac{1}{\cos 2x + \sin^2 x} dx$$



≠NH; F5L #%

F958Y,

; 9HG9H...

& \$\$

& \$ % (I of G = NH9; F5H = ON 699

≠NH9; F5L #%

$$\int_1^2 x \sqrt[3]{x-1} dx$$

‡NH9; F5L #%

$$\int_1^2 x \sqrt[3]{x-1} dx$$

$$= \int_0^1 (u+1)u^{1=3} du \quad [u = x-1; x = u+1; du = dx]$$

$$= \int_0^1 (u^{4=3} + u^{1=3}) du$$

$$= \left[\frac{3u^{7=3}}{7} + \frac{3u^{4=3}}{4} \right]_0^1 = \frac{33}{28}$$

≠NH; F5L #%

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∓NH9; F5L #%

$$\int_0^1 (x - 1)(x + 1)(x^2 + 1)(x^4 + 1) dx$$

≠NH; F5L #%

$$\int_0^1 (x - 1)(x + 1)(x^2 + 1)(x^4 + 1) dx$$

$$= \int_0^1 (x^2 - 1)(x^2 + 1)(x^4 + 1) dx$$

$$= \int_0^1 (x^4 - 1)(x^4 + 1) dx$$

$$= \int_0^1 (x^8 - 1) dx = \left[\frac{x^9}{9} - x \right]_0^1 = \boxed{-\frac{8}{9}}$$

≠NH9; F5L #%

F958Y,

; 9HG9H...

& \$\$

& \$ % (I of G = NH9; F5H = ON 699

≠NH9; F5L #%

$$\int_0^{\ln 2} e^{2x} \sqrt{e^x - 1} dx$$

D; F5L #%

$$\int_0^{\ln 2} e^{2x} \sqrt{e^x - 1} dx$$

$$\int_0^{\ln 2} e^x \cdot e^x \sqrt{e^x - 1} dx$$

$$[u = e^x - 1; \quad e^x = u + 1; \quad e^x dx = du]$$

$$= - \int_0^1 (u + 1) \sqrt{u} du = - \left[\frac{2u^{5/2}}{5} + \frac{2u^{3/2}}{3} \right]_0^1 = \boxed{16}$$