

Regular Round

Integrationbee **fjfi** 1/8

$$\int_0^{\sqrt{e^2-1}} \frac{x \ln (x^2+1)}{x^2+1} \mathrm{d} x$$

1

$$\int_0^{\frac{\pi}{4}} \sqrt{\tan(x)} \sec^6(x) \, dx$$

$$\frac{328}{231}$$

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{2}} (2 \cos (2x) \ln (\sin (x)) + \sin (2x) \cot (x)) \mathrm{d} x$$

$$\frac{\sqrt{3}}{2}\ln (2)$$

Regular Round

Integrationbee **fjfi** 2/8

$$\int_0^{\frac{\pi}{2}} \frac{dx}{1 + \sin^2(x)}$$

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

Lightninground

Seřad'te následující integrály *vzestupně*

$$\int_{-4}^2 \sqrt{17 + 4x} \, dx$$

$$\int_0^{\frac{\pi}{3}} \frac{1}{\cos^2(x)} \, dx$$

$$\int_1^2 (3x + 2) \ln x \, dx$$

$$\int_0^{\frac{\pi}{3}} \frac{1}{\cos^2(x)} \mathrm{d}x$$

$$\int_1^2 (3x + 2) \ln x \mathrm{d}x$$

$$\int_{-4}^2 \sqrt{17 + 4x} \mathrm{d}x$$

$$\int_0^{\frac{1}{2}} \frac{x^3 + 2x^2 - 4x + 16}{-2x^3 + 2x^2 - 8x + 8} dx$$

$$-\frac{1}{4} + \frac{3}{2}\ln(2) + 2\arctan\left(\frac{1}{4}\right)$$

Regular Round

Integrationbee **fjfi** 3/8

$$\int_{-1}^0 \frac{(x-2)(x+0)}{(x+2)(x+5)} \mathrm{d}x$$

$$1 + \frac{8}{3} \ln (2) - \frac{35}{3} \ln \left(\frac{5}{4} \right)$$

$$\int_0^{\frac{\pi}{4}} \frac{dx}{1 - \sin(x)}$$

$$\sqrt{2}$$

$$\int_0^{\frac{\pi}{4}} \frac{1}{e^{\sin(x)} \sqrt{e^{\sin^2(x)}} \sqrt[3]{e^{\sin^3(x)}} \sqrt[4]{e^{\sin^4(x)}} \dots} dx$$

$$\frac{\pi}{4} + \frac{\sqrt{2}}{2} - 1$$

Regular Round

Integrationbee **fjfi** 4/8

$$\int_{\frac{\pi}{2}}^{\pi} \frac{\sin^2(x)}{(x \cos(x) - \sin(x))^2} dx$$

$$\frac{1}{\pi}$$

$$\int_0^{\ln \sqrt{3}} \frac{e^{2x} + e^{3x}}{e^{2x} + 1} e^x \, dx$$

$$\sqrt{3} - \frac{1}{2} \ln(2) - \frac{\pi}{12}$$

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

$$\frac{\pi}{8}$$

Regular Round

Integrationbee **fjfi** 5/8

$$\int_1^{\sqrt[15]{2}} \frac{1}{x\sqrt{x^{15}-1}} \mathrm{d}x$$

$$\frac{\pi}{30}$$

$$\int_0^{\frac{\pi}{4}} \frac{1 - \tan^2(x)}{\sec^2(x)} dx$$

$$: \frac{1}{2}$$

Lightninground

Seřad'te následující integrály *vzestupně*

$$11 \int_{\frac{1}{7}}^{\frac{2}{7}} (1 + \cot^2(x))(1 - \cos(2x)) \, dx \qquad \int_0^{\pi} 2 \sin(x) \, dx$$

$$\int_0^{\pi} x \sin(x) \, dx$$

$$\int_0^{\pi} x \sin (x) \mathrm{d} x \quad 11 \int_{\frac{1}{7}}^{\frac{2}{7}}\left(1+\cot ^2(x)\right)(1-\cos (2 x)) \mathrm{d} x \quad \int_0^{\pi} 2 \sin (x) \mathrm{d} x$$

Regular Round

Integrationbee **fjfi** 6/8

$$\int_0^1 \frac{x e^{2x}}{(2x+1)^2} \mathrm{d}x$$

$$\frac{e^2}{12} - \frac{1}{4}$$

$$\int_0^{\frac{\pi}{4}} \frac{\sec^2 (x)}{8 + \sec^2 (x)} \mathrm{d} x$$

$$\frac{1}{3}\arctan\left(\frac{1}{3}\right)$$

$$\int_0^{\pi} e^{2x} \sin (3x) \, \mathrm{d}x$$

$$\frac{3}{13}(e^{2\pi} + 1)$$

Regular Round

Integrationbee **fjfi** 7/8

$$\int_0^{\frac{\pi}{4}} \left(\sin(x) \sqrt[3]{\sin(x)} \sqrt{\sin(x)} \cdot \sqrt[5]{\sqrt{\sin(x)} \sqrt[3]{\sin(x)}} \cdot \sqrt[7]{\sqrt[3]{\sin(x)} \sqrt[4]{\sin(x)}} \cdot \sqrt[9]{\sqrt[4]{\sin(x)} \sqrt[5]{\sin(x)} \dots} \right) dx$$

$$\frac{\pi}{8} - \frac{1}{4}$$

$$\int_{\frac{3}{2}}^{\frac{3\sqrt{2}}{2}} \frac{\sqrt{4x^2 - 9}}{x} \mathrm{d}x$$

$$3 - \frac{3\pi}{4}$$

$$\int_e^{e^2} \frac{\ln(x) + 1}{x \ln(x) + 1} dx$$

$$\ln \left(\frac{(2e^2 + 1)}{(e + 1)} \right)$$

Regular Round

Integrationbee **fjfi** 8/8

$$\int_{-2}^2 \sqrt{12 - 3x^2} \, dx$$

$$2\pi\sqrt{3}$$

$$\int_1^{\sqrt{2}} \frac{\ln (1+x^4)}{x^3} \mathrm{d} x$$

$$\arctan (2) - \frac{\pi}{4} + \frac{1}{4} \ln \left(\frac{4}{5} \right)$$

$$\int_0^{\frac{\pi}{4}} (\sec^2(x) \ln(\cos(x)) - \tan^2(x)) \, dx$$

$$-\frac{1}{2}\ln (2)$$

Quarterfinals

Integrationbee **fjfi** 1/4

$$\int_0^{\frac{\pi}{2}} \frac{\sec(x)}{2 \sec(x) + 1} dx$$

$$\frac{\pi}{3\sqrt{3}}$$

$$\int_0^{\frac{\pi}{2}} \frac{1}{1 + \tan^5(x)} dx$$

$$\frac{\pi}{4}$$

$$\int_0^1 \ln^6(x) \, dx$$

720

Quarterfinals

Integrationbee **fjfi** 2/4

$$\int_0^{\infty} \frac{x^{1010}}{(1+x)^{2022}} \mathrm{d}x$$

$$\frac{\Gamma(1011)^2}{\Gamma(2022)} = \frac{1010!1010!}{2021!}$$

$$\int_0^{\infty} \frac{2 \sin (x) \cos (x)}{2 x} \mathrm{d} x$$

$$\frac{\pi}{4}$$

$$\int_{-\infty}^{\infty} \frac{dx}{(1+x^2)(1+e^x)}$$

$$\frac{\pi}{2}$$

Quarterfinals

Integrationbee **fjfi** 3/4

$$\int_{-1}^1 \frac{\cos(x)}{1 + e^{\frac{1}{x}}} \mathrm{d}x$$

$$\sin (1)$$

$$\int_0^1 \frac{\ln(x)}{1-x^2} dx$$

$$-\frac{\pi^2}{8}$$

$$\int_0^{2\pi} \frac{dx}{2 + \cos(x)}$$

$$\frac{2\pi}{\sqrt{3}}$$

Quarterfinals

Integrationbee **fjfi** 4/4

$$\int_0^{\infty} \frac{\sqrt{1 + \sin (x)} - \cos \left(\frac{x}{2}\right)}{x} \mathrm{d} x$$

$$\frac{\pi}{2}$$

$$\int_0^1 \sin(x) \cos(1-x) \, dx$$

$$\frac{\sin (1)}{2}$$

$$\int_0^1 \frac{\ln (1-x)}{x} \mathrm{d} x$$

$$-\frac{\pi^2}{6}$$

Semifinals

Integrationbee **fjfi** 1/2



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$$\int_{-2}^2 \left(x^3 \cos \frac{x}{2} + \frac{1}{2} \right) \sqrt{4-x^2} dx$$

π

$$\int_0^\infty \left(\sin \left(\frac{1}{x} \right) - \frac{1}{\pi} \sin \left(\frac{\pi}{x} \right) \right) dx$$

$$\ln (\pi)$$

$$\int_0^{2\pi} \frac{\sin (10x)}{\sin (x)} \mathrm{d} x$$

0

Semifinals

Integrationbee **fjfi** 2/2



$$\int \frac{(1 + \ln(\sin^2 x + \cos^2 x + \tan^2 x))^\pi}{\frac{d}{dx}(\ln(\csc x) + \ln(\sec x) + \ln(\cot x))} dx$$

Derivatives For You

$\lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$		Constant Rule	$\frac{d}{dx} c = 0$
$\lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$		Power Rule	$\frac{d}{dx} x^n = nx^{n-1}$
$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$		Product Rule	$\frac{d}{dx} (uv) = u \frac{dv}{dx} + v \frac{du}{dx}$
$\frac{d}{dx} f(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$		Quotient Rule	$\frac{d}{dx} \left(\frac{u}{v} \right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$
		Chain Rule	$\frac{d}{dx} f(g(x)) = f'(g(x)) \cdot g'(x)$
$\frac{d}{dx} \left(\frac{1}{x} \right) = -\frac{1}{x^2}$		$\frac{d}{dx} x^a = ax^{a-1}$	
$\frac{d}{dx} (\sqrt{x}) = \frac{1}{2\sqrt{x}}$		$\frac{d}{dx} (x^a)^b = bx^{ab} \cdot a x^{a-1}$	
$\frac{d}{dx} (\sin x) = \cos x$		$\frac{d}{dx} (\cos x) = -\sin x$	
$\frac{d}{dx} (\sec x) = \sec x \tan x$		$\frac{d}{dx} (\csc x) = -\csc x \cot x$	
$\frac{d}{dx} (\tan^{-1} x) = \frac{1}{1+x^2}$		$\frac{d}{dx} (\cot^{-1} x) = -\frac{1}{1+x^2}$	
$\frac{d}{dx} (\csc^{-1} x) = -\frac{1}{x\sqrt{x^2-1}}$		$\frac{d}{dx} (\sec^{-1} x) = \frac{1}{x\sqrt{x^2-1}}$	
$\frac{d}{dx} (\sinh x) = \cosh x$		$\frac{d}{dx} (\cosh x) = \sinh x$	
$\frac{d}{dx} (\sinh^{-1} x) = \frac{1}{\sqrt{1+x^2}}$		$\frac{d}{dx} (\cosh^{-1} x) = \frac{1}{\sqrt{x^2-1}}$	
$\frac{d}{dx} (\sinh^{-1} x) = \frac{1}{\sqrt{1-x^2}}$		$\frac{d}{dx} (\cosh^{-1} x) = \frac{1}{\sqrt{x^2-1}}$	

$$-\frac{1}{4(\pi+1)}\left(1+\ln(\sec^2(x))\right)^{\pi+1}$$

$$\int_0^e \{x\} e^{\lfloor x \rfloor} \, dx$$

$$\frac{1 + e + e^2(e - 2)^2}{2}$$

$$I_1 = \int_{I_2+I_3}^{I_4+I_5} \left(x - \frac{3}{2}\right)^2 \mathrm{d}x, \quad I_2 = \int_0^1 t \mathrm{d}t, \quad I_3 = \int_0^{\frac{\pi}{4}} \sin(t) \mathrm{d}t, \quad I_4 = \int_1^2 t \mathrm{d}t, \quad I_5 = \int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \sin(t) \mathrm{d}t$$

$$\frac{\sqrt{2}}{6}$$

Boj o třetí místo

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$$\int_{-\pi}^{\pi} \frac{1 - \cos(x)}{1 - 2^x} \mathrm{d}x$$

π

Final

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$$\int_0^\pi \max \left(\min \left(\frac{2x}{\pi}, \sin (x) \right), \min \left(1 - \frac{2x}{\pi}, \cos (x) \right) \right) \mathrm{d} x$$

$$\frac{3\pi}{8} + 1$$