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Anti Derivatives

f

$$x^n$$

$$\sin(ax)$$

$$\exp(ax)$$

$$1/x$$

F

$$\frac{x^{n+1}}{n+1}$$

$$-\cos(ax)/a$$

$$\exp(ax)/a$$

$$\log(x)$$

PLAN

1. Poll

2. Review

3. Anti derivatives vs. indefinite integrals

4. Examples

5. Integration Bee

Yesterday

Why was yesterday a special day?

POLL

1 = indefinite
integral

2 = definite
integral

3 = Anti
Derivative

A

$$\int x^2 dx = x^3/3 + C$$

B

$$\int x^2 dx = \frac{x^3}{3}$$

C

$$\int_0^1 x^2 dx = 1/3$$

THREE NOTIONS

$$\int_a^b f(x) dx$$

Definite
integral

$$\int f(x) dx = F(x) + C$$

Indefinite
integral

$F(x) + c$ is the general anti-derivative

THE FTC

$$\frac{d}{dx} \int_a^x f(t) dt = f(x)$$

$$\int_a^x f'(t) dt = f(x) - f(a)$$

DEFINITE INTEGRALS

A

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

B

$$\int_{-1}^0 e^{-x} dx$$

C

$$\int_0^1 e^{-x} dx$$

D

$$\int_1^2 \frac{1}{x^2} dx$$

E

$$\int_0^{\pi/2} \cos(x) dt$$

F

$$\int_{-2}^2 3x^4 dx$$

INDEFINITE INTEGRALS

A $\int \frac{1}{x^2} dx$

B $\int 1/\cos^2(x) dx$

C $\int x^{-2/3} dx$

D $\int \cos(x) dx$

E Find the anti-derivative

$$\int 4 - \frac{3}{1+x^2} dx$$

with $F(0)=3$

MIT INTEGRATION BEE



SPECIAL CASES

You have $\int_a^a f(x) dx$ friends

CALCULUS

can be funny if you understand it

$$\int_a^b 1 dx = b - a$$

$$\int_a^a f(x) dx = 0$$

WHAT IS THIS?

What is $\int d(\text{cabin})/\text{cabin}$



$\log(\text{cabin})$

WHAT IS THIS?

$\int \text{devil} =$



evil + C

$$\boxed{1} \int \frac{\log(2x)}{x \log x} dx$$

$$\boxed{2} \int_0^{\infty} \frac{1}{e^x + 1} dx$$

$$\boxed{3} \int_e^{e^e} \frac{\log x \cdot \log(\log x)}{x} dx$$

$$\boxed{4} \int_0^1 \log\left(\frac{1+x}{1-x}\right) dx$$

$$\boxed{5} \int \frac{1}{x^2 + (x-1)^2} dx$$

MIT INTEGRATION BEE

Can you do one?

2 MORE CHALLENGES

From
a MIT
integration
bee
contest

A
$$\int_0^{2\pi} \sin(\sin(x) - x) dx$$

B
$$\int \frac{x^4}{x^2 + 1} dx$$

NON-ELEMENTARY

These integrals
can not be
expressed
using
elementary
functions

$$\int e^{-x^2} dx$$

$$\int \frac{1}{\log(x)} dx$$

WELLNESS DAY!

A close-up, low-angle shot of a man's face, looking down with his eyes closed. The lighting is dramatic, with strong highlights on his forehead and nose, and deep shadows elsewhere. The background is a dark, textured wall. The overall mood is contemplative and serene.

UNPLUG FOR WELLNESS DAY!

The End