November 7, 2025

Hug-a-bear Day

Today in History:

FDR wins fourth term (1944)

Tacoma Bridge collapses (1940)

Number of the Day: 4656

4656 = 2 x 2 x 2 x 2 x 3 x 97

4656 is the 96^{th} triangular number.

Fun Fact:

More men than women take Teddy Bears to bed.

Quote of the Day:

"Not everything that can be counted counts, and not everything that counts can be counted."

- Albert Einstein

Today's Weather:

Windy with rain likely, high 58^{o}.

Math 121 - Quiz #36

Find

$$\int \frac{1}{\sqrt[3]{x^2}}\, dx$$

$$= \int x^{-\frac{2}{3}}\, dx = \frac{x^{\frac{1}{3}}}{\frac{1}{3}} = 3x^{\frac{1}{3}} + C$$

POWER RULE

$$\int x^N\, dx = \frac{x^{N+1}}{N+1} + C \qquad N \neq -1$$

$$\int \frac{1}{x}\, dx = \ln|x| + C$$

SUM RULE

$$\int (f(x) + g(x))\, dx = \int f(x)\, dx + \int g(x)\, dx$$

EXAMPLE $\quad \int (x^2 + x^3)\, dx = \frac{x^3}{3} + \frac{x^4}{4} + C$

MULTIPLE RULE

$$\int c f(x)\,dx = c \int f(x)\,dx$$

EXAMPLE $\int 8x^{10}\,dx = 8\int x^{10}\,dx$

$$= 8\,\frac{x^{11}}{11} + C$$

$$\int (3x^4 + 2x + 5)\,dx = \frac{3x^5}{5} + x^2 + 5x + C$$

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

NO PRODUCT RULE.

$$= \int (x^6 - x^4 + 2x^2 - 2)\,dx$$

$$= \frac{x^7}{7} - \frac{x^5}{5} + \frac{2x^3}{3} - 2x + C$$

TRIG RULES

$$\int \sin x\,dx = -\cos x + C$$

$$\int \cos x\,dx = \sin x + C$$

$$\int \sin(kx)\,dx = -\frac{\cos(kx)}{k} + C$$

$$\int \cos(kx) = \frac{1}{k}\sin(kx) + C$$

$$\int \sec^2 x \, dx = \tan x + C$$

$$\int \sec^2(kx)\, dx = \frac{1}{k}\tan(kx) + C$$

$$\int \csc^2 x \, dx = -\cot x + C$$

$$\int \csc^2(kx)\, dx = -\frac{1}{k}\cot(kx) + C$$

EXPONENTIALS

$$\int e^x \, dx = e^x + C$$

$$\int e^{kx} \, dx = \frac{e^{kx}}{k} + C$$

$$\lim_{N \to \infty} \sum_{i=1}^{N} f(x_i)\Delta x = \int_a^b f(x)\, dx$$

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

$$\frac{d}{dx} F(x) = f(x)$$

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$$\int_a^b f(x)\,dx = F(b) - F(a)$$

WHERE $\frac{d}{dx}F(x) = f(x)$

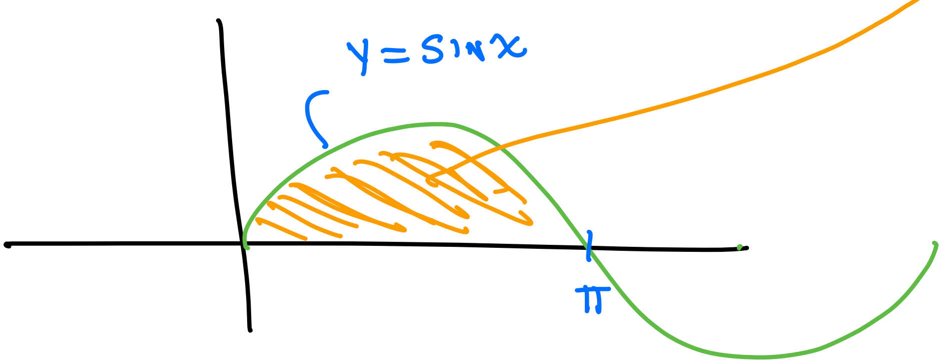
EXAMPLES

① $\int_1^3 x\,dx = \frac{x^2}{2}\Big|_1^3 = \frac{9}{2} - \frac{1}{2} = \frac{8}{2} = 4$

② $\int_2^4 x^2\,dx = \frac{x^3}{3}\Big|_2^4 = \frac{1}{3}(64-8) = \frac{56}{3}$

③ $\int_1^9 \frac{1}{\sqrt{x}}\,dx = 2\sqrt{x}\Big|_1^9 = 2(3-1) = 4$

④ $\int_0^\pi \sin x\,dx = -\cos x\Big|_0^\pi = -(-1-1) = 2$



⑤ $\int_0^3 e^{2x}\,dx = \frac{e^{2x}}{2}\Big|_0^3 = \frac{1}{2}\left[e^6 - 1\right]$

⑥ $\displaystyle\int_5^{10} \frac{1}{x}\,dx = \ln|x| \Big|_5^{10} = \ln 10 - \ln 5$

⑦ $\displaystyle\int_0^{\frac{\pi}{4}} \sec^2 x\,dx = \tan x \Big|_0^{\frac{\pi}{4}} = 1 - 0 = 1$

⑧ $\displaystyle\int_0^2 (3x^5 - 7x + 4)\,dx = \frac{3x^6}{6} - \frac{7x^2}{2} + 4x \Big|_0^2$

$\displaystyle\frac{3 \cdot 2^6}{6} - \frac{7(4)}{2} + 8 - 0 = 26$

⑨ $\displaystyle\int_1^2 \frac{x^3+1}{x^2}\,dx = \int_1^2 \frac{x^3}{x^2} + \frac{1}{x^2}\,dx$

$\displaystyle= \int_1^2 x + x^{-2}\,dx = \frac{x^2}{2} - \frac{1}{x} \Big|_1^2$

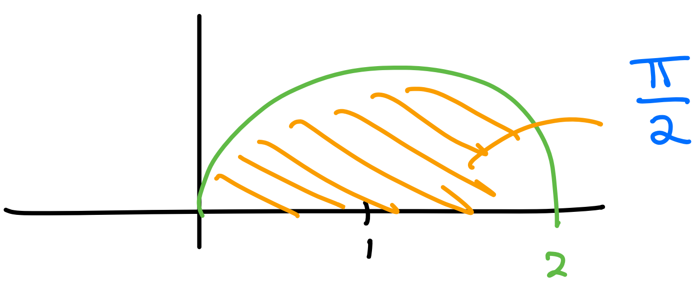
$\displaystyle\left(2 - \frac{1}{2}\right) - \left(\frac{1}{2} - 1\right) = 2$

⑩ $\displaystyle\int_0^2 \sqrt{2x - x^2}\,dx = \frac{\pi}{2}$ $\quad y = \sqrt{2x - x^2}$

$y^2 = 2x - x^2$

$x^2 - 2x + 1 + y^2 = 0 + 1$

$(x-1)^2 + y^2 = 1$ CIRCLE $(1, 0)$ $R = 1$



(11) $\displaystyle\int_{\frac{\pi}{6}}^{\frac{\pi}{4}} (5 - 2\sec x \tan x)\, dx$

$$= 5x - 2\sec x \Big|_{\frac{\pi}{6}}^{\frac{\pi}{4}}$$

$$= \left(5\left(\frac{\pi}{4}\right) - 2\sec\left(\frac{\pi}{4}\right)\right) - \left(5\left(\frac{\pi}{6}\right) - 2\sec\left(\frac{\pi}{6}\right)\right)$$

$$= \frac{5\pi}{12} - 2\sqrt{2} + \frac{4}{\sqrt{3}}$$

(12) $\displaystyle\int_1^2 \frac{(x^2+1)^2}{x^2}\, dx = \int_1^2 \frac{x^4 + 2x^2 + 1}{x^2}\, dx$

$$= \int_1^2 (x^2 + 2 + x^{-2})\, dx$$

$$= \left(\frac{x^3}{3} + 2x - \frac{1}{x}\right)\Big|_1^2$$

$$= \left(\frac{8}{3} + 4 - \frac{1}{2}\right) - \left(\frac{1}{3} + 2 - 1\right) = \frac{29}{6}$$