

①

Υπολογισμός ολοκληρωμένων ψε  
Παραγοντική ολοκληρώση  
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$$\int f'(x)g(x)dx = f(x)g(x) - \int f(x)g'(x)dx$$

$$1) \int x e^x dx = \int x(e^x)' dx = \dots$$

~~$$= \int \left(\frac{x}{2}\right)' e^{x/2} dx \quad x = \Delta EN$$~~

ΟΔΗΓΟΥΜΑΙ ΣΤΟΝ  
ΥΠΟΛΟΓΙΣΜΟ

$$2) \int x^2 e^x dx = \int x^2 (e^x)' dx = \dots$$

$$3) \int x \ln x dx = \int \left(\frac{x^2}{2}\right)' \ln x dx = \dots$$

~~$$\rightarrow \int \left(\frac{x^3}{3}\right)' e^{x/3} dx$$~~

$$(x \ln x - x)' = \underline{\ln x + x \frac{1}{x} - 1}$$

~~$$\rightarrow \int x (x \ln x - x)' dx$$~~

4)

$$I = \int x^3 \ln x dx$$

(2)

Ynáq xouz 2 emiλoxēs

1<sup>st</sup>

$$\int f'(x)g(x)dx = f(x)g(x) - \int f(x)g'(x)dx$$

$$I = \int \left(\frac{x^4}{4}\right)' \ln x dx \xrightarrow{\begin{array}{l} f(x) = \frac{x^4}{4} \\ g(x) = \ln x \end{array}} \frac{x^4}{4} \ln x - \int \frac{x^4}{4} (\ln x)' dx$$

$$= \frac{x^4}{4} \ln x - \frac{1}{4} \int x^4 \frac{1}{x} dx = \frac{x^4}{4} \ln x - \frac{1}{4} \int x^3 dx$$

$$= \frac{x^4}{4} \ln x - \frac{1}{4} \left( \frac{x^4}{4} + C \right) = \frac{x^4}{4} \ln x - \frac{1}{16} x^4 - \frac{1}{4} C$$

$$= \frac{x^4}{4} \ln x - \frac{1}{16} x^4 + C, C = -\frac{1}{4} C, C \in \mathbb{R}, G \in \mathbb{R}$$

Ζείνεται λογικό

$$I = \int x^3 \ln x dx = \int x^3 (x \ln x - x) dx =$$

$$\underline{\underline{f(x) = x \ln x - x}} \quad \underline{\underline{g(x) = x^3}}$$

$$(x \ln x - x) x^3 - \int (x^3)' (x \ln x - x) dx$$

Επίσημη σύναρτη για την υπολογισμό του I

(4)

Ynologische zu  $\int x^n \ln x dx, n \geq 1$

5)

$$(x \ln x - x)' = \ln x \Leftrightarrow$$

$$\int x \ln x dx = x \ln x - x + C, C \in \mathbb{R}$$

Ynologische zu  $I = \int \ln x dx$

$$\int f'(x)g(x)dx = f(x)g(x) - \int f(x)g'(x)dx$$

$$I = \int \ln x dx = \int 1 \ln x dx = \int x' \ln x dx \quad \begin{array}{l} f(x) = x \\ g(x) = \ln x \end{array}$$

$$\begin{aligned}
 &= x \ln x - \int x (\ln x)' dx = x \ln x - \int x \frac{1}{x} dx \quad (5) \\
 &= x \ln x - \int 1 dx = x \ln x - (x + C) = x \ln x - x - C \\
 &= x \ln x - x + C, \quad C \in \mathbb{R}, \quad C \in \mathbb{R}.
 \end{aligned}$$

6)  $\int x^n \ln x^m dx$  iste  $\rightarrow I = \int x^n u v x^m dx$   
 $\text{Ist } v = \ln x^m$

$$\begin{aligned}
 H &= \int x^n (\ln x^m)' dx \quad \underline{\frac{u(x) = n x^n}{v(x) = x^m}} \quad x^n \ln x^m - \int x^n m x^{m-1} dx \\
 &= x^n x^m - \int x^n m x^{m-1} dx = x^{n+m} - (-n x^{n+m} + C) \\
 &= x^{n+m} + n x^{n+m} + C = x^{n+m} (1 + n) + C,
 \end{aligned}$$

$$\begin{aligned}
 &\quad C \in \mathbb{R}, \quad C \in \mathbb{R}
 \end{aligned}$$

$$7) \text{ សំណើនៅក្នុងការ នៃ } I = \int x^2 n u v x \, dx \quad \text{+}$$

$$\int f'(x)g(x) \, dx = f(x)g(x) - \int f(x)g'(x) \, dx$$

$$I = \int x^2 n u v x \, dx = \int x^2 (-6uvx)' \, dx \quad \begin{array}{l} f(x) = -6uvx \\ g(x) = x^2 \end{array}$$

$$= -6uvx \cdot x^2 - \int (-6uvx)(x^2)' \, dx = -x^2 \sigma uvx + \int Guvx 2x \, dx$$

$$= -x^2 \sigma uvx + 2 \int x \sigma uvx \, dx \quad \text{X}$$

$$\begin{aligned} \int x \sigma uvx \, dx &= \int x(nu)' \, dx = xn u x - \int x' n u x \, dx = xn u x - \int n u x \, dx \\ &= xn u x - (-6uvx + c) = xn u x + Guvx - c \quad \text{b} \end{aligned}$$

(3)

And ⑥ and ⑦ exist

$$I = -x^2 \sigma_{uv} v x + 2(x n f x + \sigma_{uv} v x - c)$$

$$= -x^2 \sigma_{uv} v x + 2 x n f x + 2 \sigma_{uv} v x - 2c$$

$$= -x^2 \sigma_{uv} v x + 2 x n f x + 2 \sigma_{uv} v x + C,$$

$$C = -2c, c \in \mathbb{R}, C \in \mathbb{R}$$

2 ≈ εn, log n

$$I = \int x^2 n f x dx = \left( \frac{x^3}{3} \right)' n f x dx = \frac{x^3}{3} n f x - \int \frac{x^3}{3} (n f x)' dx$$

$$= \frac{x^3}{3} n f x - \frac{1}{3} \int x^3 \sigma_{uv} v x dx$$

που ΔΕΝ μας σεβεται  
στον υπολογισμό του αλγορίθμου

8. Integration by parts To  $I = \int e^x n \ln x dx$  (Q)

$$I = \int (e^x)' \ln x dx \quad \frac{f(x) = e^x}{\text{1st eqn}} \quad e^x n \ln x - \int e^x (n \ln x)' dx$$
$$= e^x n \ln x - \int e^x \ln x dx \Rightarrow I = \boxed{\int e^x n \ln x dx = e^x n \ln x - \int e^x \ln x dx} @$$

$$\int e^x \ln x dx = (e^x)' \ln x dx = e^x \ln x - \int e^x (\ln x)' dx$$
$$= e^x \ln x - \int e^x (-\ln x) dx = e^x \ln x + \int e^x n \ln x dx = e^x \ln x + I$$
$$\Rightarrow \int e^x \ln x dx = e^x \ln x + I \quad b$$

Aus @ kann ⑥ exakte:

$$I = e^{x \operatorname{ntf} x} - (e^{x \operatorname{ouvx}} + I) = e^{x \operatorname{ntf} x} - e^{x \operatorname{ouvx}} - I$$

$$\Rightarrow 2I = e^{x \operatorname{ntf} x} - e^{x \operatorname{ouvx}} \Rightarrow$$

$$\Rightarrow I = \frac{1}{2} e^x (\operatorname{ntf} x - \operatorname{ouvx})$$

Entspricht T ∈ ℝ mit  $I = \frac{1}{2} e^x (\operatorname{ntf} x - \operatorname{ouvx}) + C$ ,  
 $C \in \mathbb{R}$ .

Εναντιαρίζετε την  $\theta$  αλλά δεν θεωρούμε επίλυσην (11)

Διαλογή  $I = \int e^x (\ln x) dx = \int e^x (-\text{Gux})' dx = \dots$

Και οι υπόλοιπες να εναντιαρίζετε διαφορετικά

$$= -e^x \text{Gux} - \int e^x (-\text{Gux}) dx = \dots$$

$$= -e^x \text{Gux} + \int e^x \text{Gux} dx$$

$\int e^x \text{Gux} dx = \int e^x (\ln x)' dx = e^x \ln x - \int e^x \ln x dx$