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CONVENIENT AND QUICK CALCULATION METHODS OF PARTIAL INTEGRALIZATION

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Annotation. The history of the concept of integrated kvadraturalarni in the garden with the cycle. We calculate our faces, including the mathematicians of ancient Greece and Rome, the matters referred to as a flat figure of squaring issues.

$\int$ - was introduced in 1675 by Leibniz. This symbol is the Latin letter C. The word Integral was invented by J. Bernoulli in 1690. Probably, the word is derived from the Latin word " intego " , which translates as to bring to the fore.

In fact, the operation of integration "restores" the function , through this differentiation the function under the integral is created . There are many convenient methods of integration in modern textbooks and manuals. Below we give examples of ways to achieve fast results in the calculation of partial integration.

Keywords: product, integral, partial integration.

Partial integration: the function is divided into two parts accordingly. We **u** the product of one of these parts and the integral of the other part with **dx** .

$$\int \boldsymbol{u d v} = \boldsymbol{u * v} - \int \boldsymbol{v d u}$$

This formula is suitable for arbitrary integrating functions.

If the expression under this integral is polynomial, then $\int P(x) * Q(x)dx$ it is calculated as follows:

$$\int \boldsymbol{P(x) * Q(x) dx} = \boldsymbol{P(x)} * \int \boldsymbol{Q(x) dx} - \boldsymbol{P`(x)} * \iint \boldsymbol{Q(x) dx} + \dots \dots$$

If we show it in tabular form, it will look like this:

Yield	Integral	The sign that precedes the corresponding product (that is, multiplied by this sign)
P (x)	Q (x)	
P` (x)	$\int Q(x)dx$	+1
P`` (x)	$\iint Q(x)dx$	-1
P``` (x)	$\iiint Q(x)dx$	+1
	***	-1

Here , P (x) crop to harvest the ` zero fill .

1-for example . Find the indefinite integral of the form $\int x\, e^x$dx .

Method 1 .

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

u = x **dv** =dx **du** = dx **v** = e^x

Method 2 .

$\int x\, e^x$dx=$\int x * e^x\, dx$ Let's write in the form. From this we see that there are two functions f (x) = x and g (x) = e^x. We can create a table as follows:

Yield	Integral	The sign that precedes the corresponding product (that is, multiplied by this sign)
x	e^x	
1	e^x	+ 1
0	e^x	- 1
	e^x	+ 1

We multiply them accordingly and put a sign in front of them.

The result is the following expression: $\int x * e^x\, dx = x * e^x - e^x + C$

It will be more convenient for students to work in this way.

Finding the integral in this way, one of the functions under the integral must be easily integrated and the product of the other must be zero.

Example 2 : $\int \mathbf{x\,sinxdx}$ calculate the integral.

Method 1

$$\int x \sin x \, dx = -x * \cos x + \int \cos x dx = -x * \cos x + \sin x + C \qquad \textbf{(1)}$$

We enter the designation as follows:

u = x dv = sinxdx d u = dx v = -cosx

Method 2 .

We get P (x) = x Q (x) = sinx.

yield	integral	The sign that precedes the corresponding product (that is, multiplied by this sign)
P (x) = x	Q (x) = sinx	
P\` (x) = 1	$\int sinxdx = -cosx$	+ 1
P\`\` (x) = 0	$\iint sinxdx = -\int cosxdx == -sinx$	- 1

As a rule, we can multiply the corresponding functions.

$\int x * sinxdx$ =-x*cosx+sinx+C **(2)**

Apparently, the results are the same.

Example 3 . $\int x^2\, cosxdx$ find the indefinite integral.

Method 1 .

Using the classical method of partial integration , we obtain

u= x^2 and dv= cosx. d u = $2x$ v = sinx.

Hence $\int x^2\, cosxdx = x^2 * sinx - \int 2x * sinxdx$ **(3)** is formed.

Divide by $\int x * sinxdx$ again and apply the integral.

Where u = x dv = sin x dx du = dx v = -cosx

$$2\int x * sinxdx = 2 * (-x * cosx + \int cosxdx) = 2 * (-x * cosx + sinx) = -2xcosx + 2sinx + C$$

(4)

We bring (4) to (3)

$\int x^2\, cosxdx = x^2 * sinx - (-2xcosx + 2sinx) + C = x^2 * sinx + 2xcosx - 2sinx$+c**(5)**

Method 2

x^2 derivative function , $cos\,x$ is an integral funsiyasi can be added.

yield	**integral**	**The sign that precedes the corresponding product (that is, multiplied by this sign)**
x^2	cosx	
2x	sinx	+1
2	-cosx	-1
0	-sinx	+1
	cosx	-1

Multiply the set of matches: is$x^2 * sinx + 2xcosx - 2sinx$ formed. From this we record the following result.

$$\int x^2 * cosxdx = x^2 * sinx + 2xcosx - 2sinx - C \qquad (6)$$

There are many such examples. With this method, we can achieve the goal faster if we use it in examples where the application of the integral is used many times.

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