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11TH GRADE STUDENTS IN PIECES INTEGRATION TEACHING

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Annotation
In the article in pieces of integration simpler ways given also two _ _ and in it more than in pieces to integration circle functions generalized in pieces integration method faster to the solution have to be seeing let's go out, one from one we distinguish and given examples one by one analysis we do

Keywords: Integrals, generalized in pieces integration and in pieces integration.

Introduction

President's speech on May 7, 2020 " Mathematics in the field education quality increase and scientific research development remedy events on" in decision PQ-4708 so quoted : " General education in their schools mathematics textbooks of students to his age relatively science difficult complicated from issues and another in the sciences passable topics with not harmonized ".

Technique and in technology , curve linear the trapezoid face in determining applied integrals school in the textbook later training , new methods input today's in the day very important _ In particular , 11th grade mathematics in the textbook in pieces to integration circle data very less is presented because of this method wider explanation and new methods input very important _ For this reason generalized in pieces integration and simple in pieces of integration from each other differences in more detail let's light up and in life wide from manuals this the subject seeing I'm going out generalized in pieces integration method analysis we do

Integrate initial concepts in 11th grade textbooks giving will go and of integration simple rules are unclear integrals and sure to integrals circle examples is given Later on while higher education on the gallows mathematics analysis science through this to the topic circle concepts will be expanded .

Hypothesis let , $u(x)$and $v(x)$the functions $(a, b)$are differentiable on the interval and $v(x) \cdot u'(x)$let the function have an initial function on this interval. Then $u(x) \cdot v'(x)$the function has an initial function and

$\int u(x) \cdot v'(x)dx = u(x) \cdot v(x) - \int v(x) \cdot u'(x)dx$equality is appropriate ,

This is equality in pieces integration formula is called In pieces integration formula

$$\int u(x) \cdot dv(x) = u(x) \cdot v(x) - \int v(x) \cdot u'(x)dx$$

in the form of you can also write .

The following for example our attention let 's look

Example 1.

$\int x^5 e^x dx$use the formula of integration by pieces several times right will come ie

$$\int x^5 e^x dx = \begin{bmatrix} u = x^5 \\ dv = e^x \end{bmatrix} \begin{bmatrix} du = 5x^4 dx \\ v = e^x \end{bmatrix} = x^5 e^x - 5\int x^4 e^x dx = \begin{bmatrix} u = x^4 \\ du = 4x^3 dx \end{bmatrix} \begin{bmatrix} dv = e^x \\ v = e^x \end{bmatrix} =$$

$$x^5 e^x - 5x^4 e^x + 20\int x^3 e^x dx = \begin{bmatrix} u = x^3 \\ du = 3x^2 dx \end{bmatrix}$$

$$\begin{bmatrix} dv = e^x \\ v = e^x \end{bmatrix} = x^5 e^x - 5x^4 e^x + 20x^3 e^x - 60\int x^2 e^x dx = \begin{bmatrix} u = x^2 \\ du = 2xdx \end{bmatrix}$$

$$\begin{bmatrix} dv = e^x \\ v = e^x \end{bmatrix} = x^5 e^x - 5x^4 e^x + 20x^3 e^x - 60x^2 e^x + 120\int xe^x dx = \begin{bmatrix} u = x \\ du = dx \end{bmatrix}$$

$$\begin{bmatrix} dv = e^x \\ v = e^x \end{bmatrix} = x^5 e^x - 5x^4 e^x + 20x^3 e^x - 60x^2 e^x + 120xe^x - 120e^x + C$$

Answer :$(x^5 - 5x^4 + 20x^3 - 60x^2 + 120x - 120)e^x + C$

There are many of us in this formula time we spend and pedagogues and teachers to the difficulty face will come .

Now generalized in pieces integration seeing let's go

$\int x^5 e^x dx$we split this function into 2 functions $x^5$and e^x. And then

x^5 +

e^xOnly the derivative is right from the left part by while

$5x^4$-e^x

we only get the beginning. In the diagonal direction

$20x^3$ +

e^x multiply and write the last terms horizontally

60 x^2- e^x

multiply in the direction and under the integral

$120x$+ e^x

we write. Also signs are "+", " -" , "+", "-".

120 - e^x

written interchangeably.

0 + e^x

That is,

$$x^5 e^x - 5x^4 e^x + 20x^3 e^x - 60x^2 e^x + 120xe^x - 120e^x + \int 0 \cdot e^x dx =$$
$$= x^5 e^x - 5x^4 e^x + 20x^3 e^x - 60x^2 e^x + 120xe^x - 120e^x + C$$

Answer : $(x^5 - 5x^4 + 20x^3 - 60x^2 + 120x - 120)e^x + C$

Now let's turn our attention to example 2 let 's look

Example 2.

$\int x^2 sinxdx$in this example we will have to use the usual splits several times. And by generalized piecewise integration, we get the solution faster.

At first we are simple in pieces integration from the formula using for example solution we find

$$\int x^2 sinxdx = \begin{bmatrix} u = x^2 \\ du = 2xdx \end{bmatrix}\begin{bmatrix} dv = sinx \\ v = -cosx \end{bmatrix} = -x^2 cosx + 2\int xcosx =$$

$$\begin{bmatrix} u = x \\ du = dx \end{bmatrix}\begin{bmatrix} dv = cosx \\ v = sinx \end{bmatrix} = -x^2 cosx + 2xsinx - 2\int sinxdx =$$

$$= -x^2 cosx + 2xsinx + 2cosx + C$$

Answer :$-x^2 cosx + 2xsinx + 2cosx + C$

This example generalized in pieces integration formula through solution we do As we saw in Example 1 this function also into 2 parts separate we get and from the left part only derivative right from the part while only initial we get need _

x^2 + $sinx$ Multiply diagonally as usual

$2x$- $-cosx$ we write, terms in the horizontal direction

We write the product 2+ $-sinx$ under the integral.

0 -$cosx$

$-x^2 cosx + 2xsinx + 2cosx - \int 0 \cdot cosxdx = -x^2 cosx + 2xsinx + 2cosx$+C

Answer : $-x^2 cosx + 2xsinx + 2cosx$+C

Above 2 examples given using the we derivative finite has been functions we saw Natural question is born Both the derivative and the origin are infinite continue doer of functions from the product under the integral consisting of expressions how integrate ? An example for exponential functions both derivative and origin are infinite respectively continue that it will good we know the same that's it thoughts trigonometric functions sine and to the cosine also use relatively can _ Here's what's in Example 3 below to the question answer we find

First we are this function simple fragmentation formula through to the solution we bring

So , to us the following function given let it be

Example 3.

$$\int e^x sinxdx = \begin{bmatrix} u = e^x \\ du = e^x \end{bmatrix}\begin{bmatrix} dv = sinx \\ v = -cosx \end{bmatrix} = -e^x cosx - \int -e^x cosxdx =$$

$$= \begin{bmatrix} u = e^x \\ du = e^x \end{bmatrix}\begin{bmatrix} dv = -cosx \\ v = -sinx \end{bmatrix} = -e^x cosx + e^x sinx - \int e^x sinxdx =$$

this situation cause from what we received then we introduce the definition as , $\int e^x sinxdx = A$and then we have the following state.

$\int e^x sinxdx = -\, e^x cosx + e^x sinx - \int e^x sinxdx$b it and here it is way writing we get can _ $A = -e^x cosx + e^x sinx - A$in the last step, Awe find the solution of the equation with respect to

$$2A = -e^x cosx + e^x sinx + C \quad A = \frac{-e^x cosx + e^x sinx}{2} + C$$

Answer :$\frac{1}{2} e^x (sinx + cosx) + C$

Now we have generalized in pieces integration method we use

$\int e^x sinxdx$in such a case, we first $\int e^x sinxdx = A$define that and then apply the generalized piecewise integration method.

e^x $sinx$ As we can see, continue indefinitely
e^x $-cosx$ we can continue. Therefore, in the condition of the example
e^x $-sinx$ $sinx$ taking into account received without his beginnings
e^x $cosx$ $-sinx$Increase b until we can That is ,
. . as follows to the situation cause we get it is necessary
. .

e^x → $+sinx$

e^x − → $-cosx$

e^x + → $-sinx$

$A = -e^x cosx + e^x sinx - \int e^x sinxdx$we $\int e^x sinxdx = A$have defined as , and from this we write the following.

$$A = -e^x cosx + e^x sinx - A$$
$$2A = -e^x cosx + e^x sinx$$
$$A = \frac{-e^x cosx + e^x sinx}{2}$$

that we find So We do the following to the answer have we were
Answer :

$$A = \frac{1}{2}e^x(sinx + cosx) + C$$

We are exponential function attended examples one see how many times analysis we did now while pointer function and level function multiplication how integration analysis we do

Consider example 4 below look _

Example 4. $\int x^4 4^x\, dx$let's integrate this function. First, we find the solution to the example with the simple integration by pieces as above, and then with the method of generalized integration by pieces.

$$\int x^4 4^x\, dx = \begin{bmatrix} u = x^4 \\ du = 4x^3dx \end{bmatrix}\begin{bmatrix} dv = 4^x \\ v = \frac{4^x}{ln4} \end{bmatrix} = \frac{4^x x^4}{ln4} - \frac{4}{ln4}\int x^3 4^x dx =$$

$$= \begin{bmatrix} u = x^3 \\ du = 3x^2dx \end{bmatrix}\begin{bmatrix} dv = 4^x \\ v = \frac{4^x}{ln4} \end{bmatrix} = \frac{4^x x^4}{ln4} - \frac{4x^3}{\ln^2 4}4^x + \frac{12}{\ln^2 4}\int x^2 4^x dx =$$

$$= \begin{bmatrix} u = x^2 \\ du = 2xdx \end{bmatrix}\begin{bmatrix} dv = 4^x \\ v = \frac{4^x}{ln4} \end{bmatrix} = \frac{4^x x^4}{ln4} - \frac{4x^3}{\ln^2 4}4^x + \frac{12x^2}{\ln^3 4}4^x - \frac{24}{\ln^3 4}\int x 4^x dx =$$

$$=\begin{bmatrix} u = x \\ du = dx \end{bmatrix}\begin{bmatrix} dv = 4^x \\ v = \dfrac{4^x}{ln4} \end{bmatrix} = \frac{4^x x^4}{ln4} - \frac{4x^3}{\ln^2 4}4^x + \frac{12x^2}{\ln^3 4}4^x - \frac{24x}{\ln^4 4}4^x +$$

$$+\frac{24}{\ln^4 4}\int 4^x dx = \frac{4^x x^4}{ln4} - \frac{4x^3}{\ln^2 4}4^x + \frac{12x^2}{\ln^3 4}4^x - \frac{24x}{\ln^4 4}4^x + \frac{24}{\ln^4 4} + \frac{24}{\ln^5 4}4^x + C$$

Answer :

$\frac{4^x x^4}{ln4} - \frac{4x^3}{\ln^2 4}4^x + \frac{12x^2}{\ln^3 4}4^x - \frac{24x}{\ln^4 4}4^x + \frac{24}{\ln^4 4} + \frac{24}{\ln^5 4}4^x + C$

Now while generalized in pieces integration through example the solution we find

$$\int x^4 4^x \, dx =$$

x^4 + 4^x

$4x^3$ − $\frac{4^x}{ln4}$

$12\,x^2$+$\frac{4^x}{\ln^2 4}$

$24x$ − $\frac{4^x}{\ln^3 4}$

24+$\frac{4^x}{\ln^4 4}$

0 − $\frac{4^x}{\ln^5 4}$

The above such as functions shown in the direction we multiply .

$$\frac{4^x x^4}{ln4} - \frac{4x^3}{\ln^2 4}4^x + \frac{12x^2}{\ln^3 4}4^x - \frac{24x}{\ln^4 4}4^x + \frac{24}{\ln^4 4} + \frac{24}{\ln^5 4}4^x - \int 0 \cdot \frac{4^x}{\ln^5 4} =$$

$$= \frac{4^x x^4}{ln4} - \frac{4x^3}{\ln^2 4}4^x + \frac{12x^2}{\ln^3 4}4^x - \frac{24x}{\ln^4 4}4^x + \frac{24}{\ln^4 4} + \frac{24}{\ln^5 4}4^x + C$$

Answer :$\frac{4^x x^4}{ln4} - \frac{4x^3}{\ln^2 4}4^x + \frac{12x^2}{\ln^3 4}4^x - \frac{24x}{\ln^4 4}4^x + \frac{24}{\ln^4 4} + \frac{24}{\ln^5 4}4^x + C$

Logorithmic function and level function attended examples analysis we do Your attention the following for example look at :

Example 5.$\int x^3 \ln x \, dx$

In pieces integration formula through we work

$$\int x^3 \ln x \, dx = \begin{bmatrix} u = \ln x \\ du = \dfrac{1}{x} \end{bmatrix}\begin{bmatrix} dv = x^3 \\ v = \dfrac{x^4}{4} \end{bmatrix} = \frac{x^4}{4}\ln x - \frac{1}{4}\int x^3 dx =$$

$$\frac{x^4}{4}\ln x - \frac{x^4}{16} + C$$

Answer :

$$\frac{x^4}{4}\ln x - \frac{x^4}{16} + C$$

Generalized in pieces integration method through example the solution we find

$$\begin{array}{ccc} \ln x & + & x^3 \\ \frac{1}{x} & - & \frac{x^4}{4} \end{array}$$

$$\int x^3 \ln x \, dx = \frac{x^4}{4} \ln x - \frac{1}{4} \int x^3 dx = \frac{x^4}{4} \ln x - \frac{x^4}{16} + C$$

Answer :

$$\frac{x^4}{4} \ln x - \frac{x^4}{16} + C$$

Summary by doing to say in pieces _ of integration generalized in pieces integration method one so much comfortable and that's it because of the 11th grade school in textbooks apply efficient will be

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