METHODS OF CALCULATING SOME NON-STANDARD INTEGRALS

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ABSTRACT

This article presents methods of calculating some non-standard exact integrals found in mathematics. Through these, the student learns that he can solve problems not only in the same way, but also through different creative thinking.

Keywords: Exact integral, variable, odd and even functions, rational function, MATLAB

INTRODUCTION

In mathematics, there are such forms of the exact integral that make it difficult for the student to calculate them. In this article, such a problem is calculated in a somewhat easier way.

The following integral is one of such integrals

We use an unusual method to calculate this integral. The function under the integral

and $u(x)=e^{-2x}$ we can say. Now $g(x)$ the function can be written as a sum of even and odd functions, i.e

In this $g_t(x)$ - odd function, $g_j(x)$ - even function. And from these equations

equalities arise.

Then the above integral

appears. Since the integral of an odd function on a symmetric interval is zero equality is formed. We simplify the function under the integral

$u(x)u(-x)=1$ from being

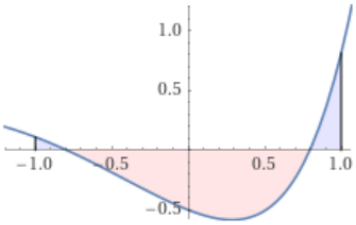
originates. So

is formed. Using WolframAlpha or MATLAB, the result is as follows.

Definite integral

$$\int_{-1}^{1} \frac{1+x^4-2\cos(x)}{1+e^{-2x}}\,dx = -0.482942$$

Visual representation of the integral



POWERED BY THE WOLFRAM LANGUAGE

Now consider this special integral :

This special integral

we will record it in the form and J_1 in the integral $t=\frac{1}{x}$ we change the variable:

From this

originates. And so

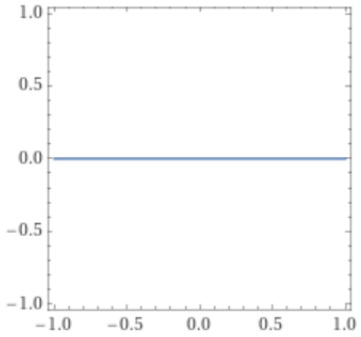
The result of this using WolframAlpha software is as follows.

Definite integral

$$\int_0^{\infty} \frac{\log(x)}{1+x^2}\,dx = 0$$

$\log(x)$ is the natural logarithm

Plot



Problems for independent solution

1. Calculate the definite integral $I = \int_{-2}^{2} \frac{x^2 - 2|x| + 1}{e^{\frac{2}{x}} + 1} dx$

2. Calculate the definite integral $I = \int_{-1}^{1} \frac{x^2 + |x| + \cos x}{e^x + 1} dx$

3. Calculate the definite integral $I = \int_{-1}^{1} \frac{x^4 + |x| \cos x + 2}{e^{-4x} + 1} dx$

4. Calculate the special integral $J = \int_{0}^{\infty} \frac{\ln x}{4 + x^2} dx$

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