UDC 519.6

SIMPSON'S 1/3 METHOD VIA PYTHON

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It is well known that $\int e^{x^2} dx$ is non-elementary, that is there is no antidervative of the integrand in terms of elemntary functions. By using the Simpson's 1/3 method we provide a program written in Pyhton to approximate this integral over an arbitrary interval and an arbitrary number of subintervals. We should mention that this program also works for the other non-elemntary functions.

Results

Code in Python:

```
import math
def f(x):
    return math.exp(x*x)
lower = float(input("Enter lower limit of integration: "))
upper = float(input("Enter upper limit of integration: "))
subInterval = int(input("Enter number of sub intervals: "))
stepSize = (upper - lower)/subInterval
integration = f(lower) + f(upper)
for i in range(1, subInterval):
    k = lower + i*stepSize
    if i%2 == 0:
        integration += 2 * f(k)
    else:
        integration += 4 * f(k)
integration = integration * stepSize/3
print("Required value of integration is:", integration)
```

Output:

```
Enter lower limit of integration: 0
Enter upper limit of integration: 5
Enter number of sub intervals: 100
```

Approximation of the integration by Simpson's 1/3 method is: 7356716956.432715.

Refrences:

1. Abramowitz, M.; Stegun, I. A. (1970), Handbook of Mathematical Functions. New York: Dover Publications.

2. Matthews, John H. (2004), "Simpson's 3/8 Rule for Numerical Integration". Numerical Analysis - Numerical Methods Project.