Midterm question 3

May 4, 2018

In [1]:
```
from sympy import*
%matplotlib inline
import matplotlib.pyplot as plt
from __future__ import division
x, y, z, t = symbols('x y z t')
k, m, n = symbols('k m n', integer = True)
f, g, h = symbols('f g h', cls = Function)
import math
```

In [2]:
```
def f(x):
    return math.e**(-x)*x**(5.1)
```

In [3]:
```
def compositeSimpson(startPoint, endPoint, numIntervals):
    a = startPoint
    b = endPoint
    n = numIntervals
    h = (b - a) / n
    leftRight = f(a) + f(b)
    oddSum = 0
    evenSum = 0
    for i in range (1, n):
        x = a + i*h
        if i % 2 == 1:
            oddSum = oddSum + f(x)
        else:
            evenSum = evenSum + f(x)
    areaEstimate = h * (leftRight + 2*evenSum + 4*oddSum) / 3
    return areaEstimate
```

In [6]:
```
def midterm(initial):
    areaEstimate = 0
    while abs(areaEstimate - 6.1) > 0.00001:
        areaEstimate = compositeSimpson(0, initial, 50)
        initial = initial + 0.000001
    return initial
```

In [7]:
```
midterm(2.57)
```

```
Out[7]: 2.576475000000905

In [8]: abs(6.1 - compositeSimpson(0, 2.576475, 100))

Out[8]: 1.0357748525535726e-07
```