# RAFAY AAMIR GULL
# BSEE19047
# NA ASSIGNMENT 4

## Q1:

**CODE:**

```
%RAFAY AAMIR GULL (BSEE19047)
clc

% Setting x as symbolic variable
syms x;

%Input Section
c=12.5;
m=68.1;
d=289.43515;
g=9.8;
eq = int((1-(exp(-(c/m)*x))), 0, x);
y = eq-((d*c)/(g*m));

%y = input('Enter non-linear equations: ');
a = input('Enter initial guess: ');
e = input('Tolerable error: ');
N = input('Enter maximum number of steps: ');
% Initializing step counter
step = 1;
disp(y)
```

```
% Finding derivate of given function
g = diff(y,x);

% Finding Functional Value
fa = eval(subs(y,x,a));
while abs(fa)> e
fa = eval(subs(y,x,a));
ga = eval(subs(g,x,a));
if ga == 0
disp('Division by zero.');
break;
end
b = a - fa/ga;
fprintf('step=%d\ta=%f\tf(a)=%f\n',step,a,fa);
a = b;
if step>N
disp('Not convergent');
break;
end
step = step + 1;
end
fprintf('Root is %f\n', a);
```

**OUTPUT**

Command Window

```
Enter initial guess: 1
Tolerable error: 0.001
Enter maximum number of steps: 25
x + (681*exp(-(125*x)/681))/125 - 23901422306787421/2199023255552000

step=1  a=1.000000  f(a)=-5.334698
step=2  a=32.812341 f(a)=21.956432
step=3  a=10.802583 f(a)=0.683533
step=4  a=10.009920 f(a)=0.008339
step=5  a=10.000002 f(a)=0.000001
Root is 10.000000
fx >>
```

# Q2:

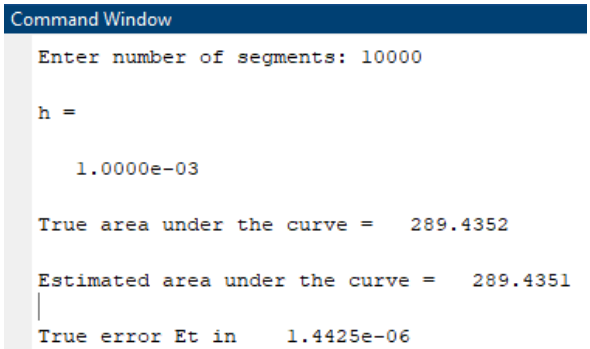
**CODE:**

```
clc
clear
syms x
c=12.5;
m=68.1;
d=289.43515;
g=9.8;
% Lower Limit
a=0;
% Upper Limit
b=10;
% Number of segments
n=input("Enter number of segments: ");
% Declare the function
eq = (1-(exp(-(c/m)*x)));
f1=((g*m)/c)*eq;
%f1=0.2+25*x-200*x^2+675*x^3-
900*x^4+400*x^5;
% inline creates a function of
% string containing in f1
f=inline(f1);
% h is the segment size or step size
h=(b - a)/n;
h
% X stores the summation of first
% and last segment
X=f(a)+f(b);
% variable R stores the summation of
% all the terms from 1 to n-1
R=0;
for i = 1:1:n-1
xi=a+(i*h);
R=R+f(xi);
end
% Formula to calculate numerical
integration
% using Trapezoidal Rule
I=(h/2)*(X+(2*R));

Et = (abs(d-I)/d)*100;
% Display the output

fprintf('True area under the curve =
');
disp(d);
fprintf('Estimated area under the
curve = ');
disp(I);
fprintf('True error Et in % = ');
disp(Et);
```

**OUTPUT**




| No of Segments | Step/Segment size | True Area | Estimated Area | True Error |
|---|---|---|---|---|
| 10 | 1 | 289.4352 | 288.7491 | .2370 |
| 50 | 0.2 | 289.4352 | 289.4077 | .0095 |
| 500 | 0.02 | 289.4352 | 289.4349 | 9.6064e-05 |
| 1000 | 0.01 | 289.4352 | 289.4351 | 2.4920e-05 |
| 2000 | 0.005 | 289.4352 | 289.4351293516570 | 7.1340e-06 |
| 4000 | 0.0025 | 289.4352 | 289.4351422213844 | 2.6875e-06 |
| 5000 | 0.002 | 289.4352 | 289.4351437657520 | 2.1539e-06 |
| 6500 | 0.0015 | 289.4352 | 289.4351448867133 | 1.7666e-06 |
| 8000 | 0.0013 | 289.4352 | 289.4351454388166 | 1.5759e-06 |
| 9000 | 0.0011 | 289.4352 | 289.4351456639053 | 1.4981e-06 |
| 10000 | 0.001 | 289.4352 | 289.4351458249088 | 1.4425e-06 |