

Practical 8: Iterative Calculation

(a) Program for Iterative Calculation

Problem Statement: Write and execute scilab code for the following:

Evaluate $e^{0.5}$ and compare with the true value 1.648721. Use 6 terms to evaluate each series and compute true and approximate relative error (upto 3 significant figures as terms are add)

$$e^x = 1 + x/1! + x^2/2! + x^3/3! + \dots + x^n/n! + \dots$$

Scilab Code:

```
clc;
clear;
n=3;
es=0.5*(10^(2-n));
x=0.5;
f(1)=1;
ft=1.648721;
et(1)=(ft-f(1))*100/ft;
ea(1)=100;
i=2;
while ea(i-1)>=es
    f(i)=f(i-1)+(x^(i-1))/(factorial(i-1));
    et(i)=(ft-f(i))*100/ft;
    ea(i)=(f(i)-f(i-1))*100/f(i);
    i=i+1;
end
for j=1:i-1
    disp("Approximate estimate of error(%)=",ea(j),"True % relative
error=",et(j),"Result=",f(j),"Term Number",j)
    disp("-----")
end
```

Output:

"Approximate estimate of error(%)="

100.

"True % relative error="

39.346924

"Result="

1.

"Term Number"

1.

"-----"

"Approximate estimate of error(%)="

33.333333

"True % relative error="

9.0203861

"Result="

1.5

"Term Number"

2.

"-----"

"Approximate estimate of error(%)="

7.6923077

"True % relative error="

1.4387516

"Result="

1.625

"Term Number"

3.

"-----"

"Approximate estimate of error(%)="

1.2658228

"True % relative error="

0.1751459

"Result="

1.6458333

"Term Number"

4.

"-----"

"Approximate estimate of error(%)="

0.1579779

"True % relative error="

0.0171951

"Result="

1.6484375

"Term Number"

5.

"-----"

"Approximate estimate of error(%)="

0.0157953

"True % relative error="

0.0014001

"Result="

1.6486979

"Term Number"

6.

"-----"

-->

(b)Program to calculate the roots of quadratic equation using the formula.

Problem Statement: Write scilab code to evaluate roots of quadratic equation $x^2+5x-6=0$.

Scilab Code:

```
clc;
clear;
disp('Roots of x^2+5*x-6=0');
p=poly([-6 5 1],"x","coeff");
r=roots(p);
disp("Roots of x^2+5*x-6=0 are:",r);
```

Output:

```
"Roots of x^2+5*x-6=0"

"Roots of x^2+5*x-6=0 are:"

-6. + 0.i
 1. + 0.i

--> |
```

(c) Program to evaluate e^x using infinite series

Problem Statement: The exponential function e^x is given by

$$e^x = 1 + x/1! + x^2/2! + x^3/3! + \dots + x^n/n! + \dots$$

Evaluate this function at $x=5$ i.e calculate write a scilab code for above mentioned function.

Scilab Code:

```
clc;
clear;
sum=1;
x=5;
for i=1:100
    sum=sum+((x^i)/factorial(i));
end
printf("\n e^5=%0.4f",sum);
```

Output:

```
e^5=148.4132
-->
```