# CS / MATH 4334 : Numerical Analysis
# Homework Assignment 6

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December 17, 2018

## MatLab Problems

Problem 1 : p1.m

```
format long e

clc
clear

for i=1:4
    n = power(10,i);
    t = linspace(0,4,n+1)';

    w = wtseries(t);
    y = actual(t);

    plot(t, w, t, y)
    title(['approx v.s. actual @ n=' num2str(n)])
    legend("Approx", "Actual")
    xlabel("Input 't'")
    ylabel("Output")
    figure()
end

err = abs(w - y);
plot(t, err)
title('error v.s t @ n=10000')
legend("error")
xlabel("t")
ylabel("error")



fprintf('If we increase the number of points by a factor of
   10, then our global error decreases by a factor of 10. Thus
    it has a linear relation, O(h), as we expect.\n');
```

Problem 1 : wtseries.m

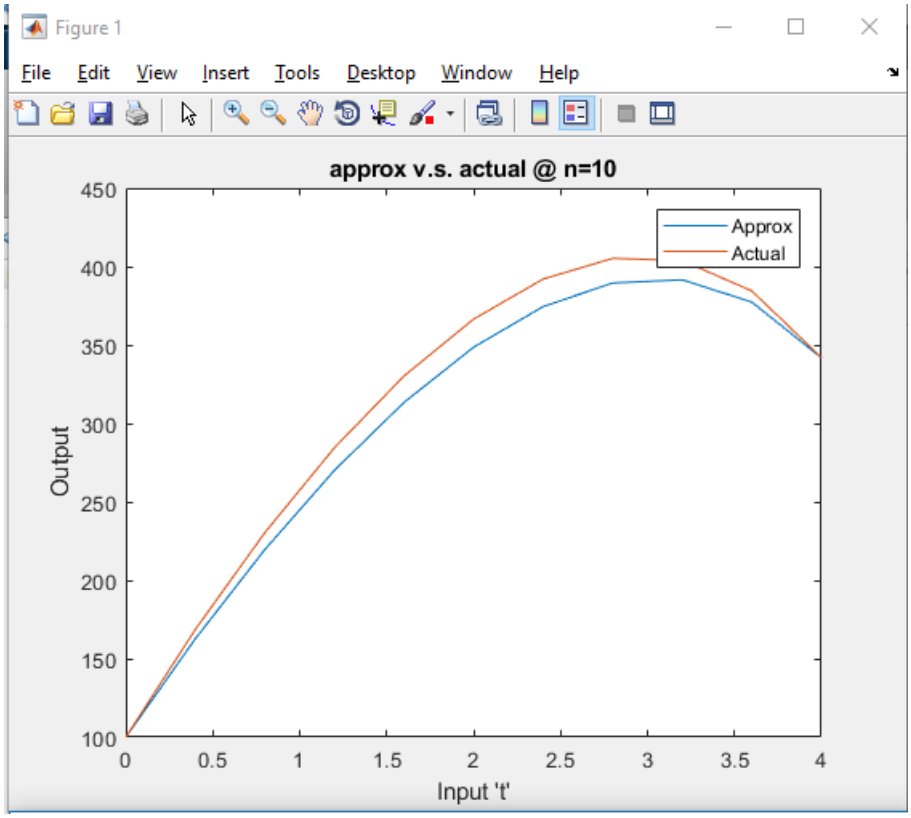
```
function [w] = wtseries(t)
    n = length(t);
    h = 4/n;
    w = zeros(n,1);
    w(1) = 100;

    for i=2:n
        w(i) = w(i-1) + (h)*(200 + (w(i-1)/(t(i-1)-5))) + (h
            ^2/2)*(200/(t(i-1)-5)) - (h^3/6)*(200/((t(i-1)-5)
            ^2));
    end

end
```

Problem 1 : actual.m

```
function [y] = actual(t)
    n = length(t);
    y = zeros(n,1);
    for i=1:n
        y(i) = 20 * (5 - t(i)) * (10 * log((5 / (5 - t(i)))) +
            1);
    end
end
```

>> p1.m

If we increase the number of points by a factor of 10, then our global error decreases by a factor of 10. Thus it has a linear relation, O(h), as we expect.



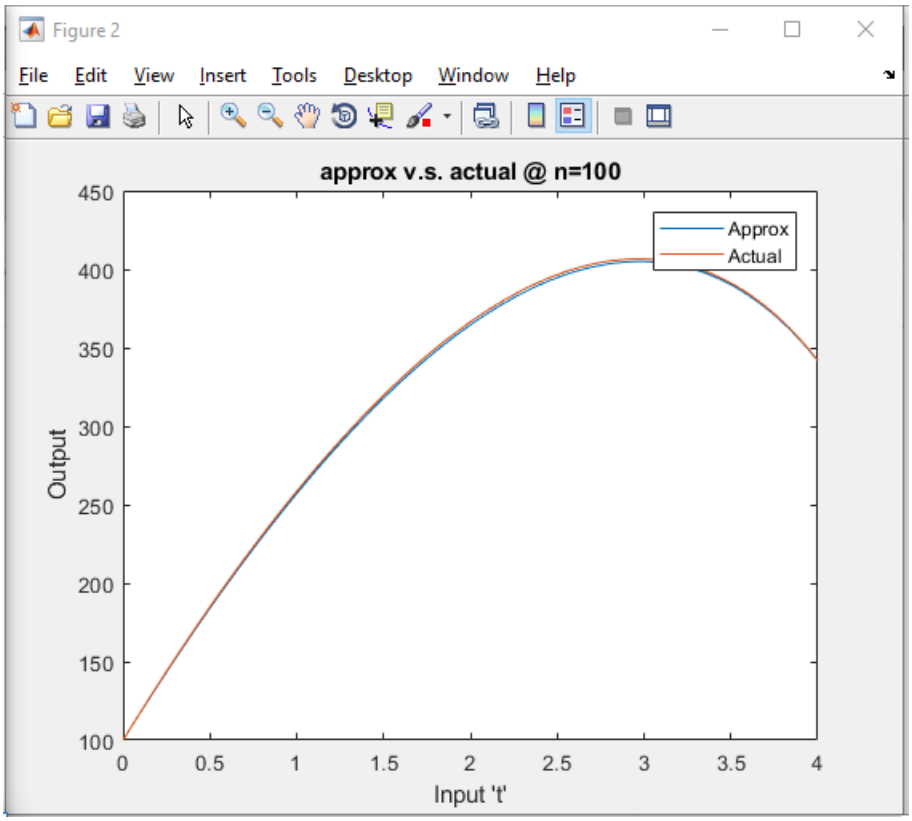


Figure 2
File Edit View Insert Tools Desktop Window Help
approx v.s. actual @ n=100
Approx
Actual
Output
Input 't'
100
150
200
250
300
350
400
450
0
0.5
1
1.5
2
2.5
3
3.5
4

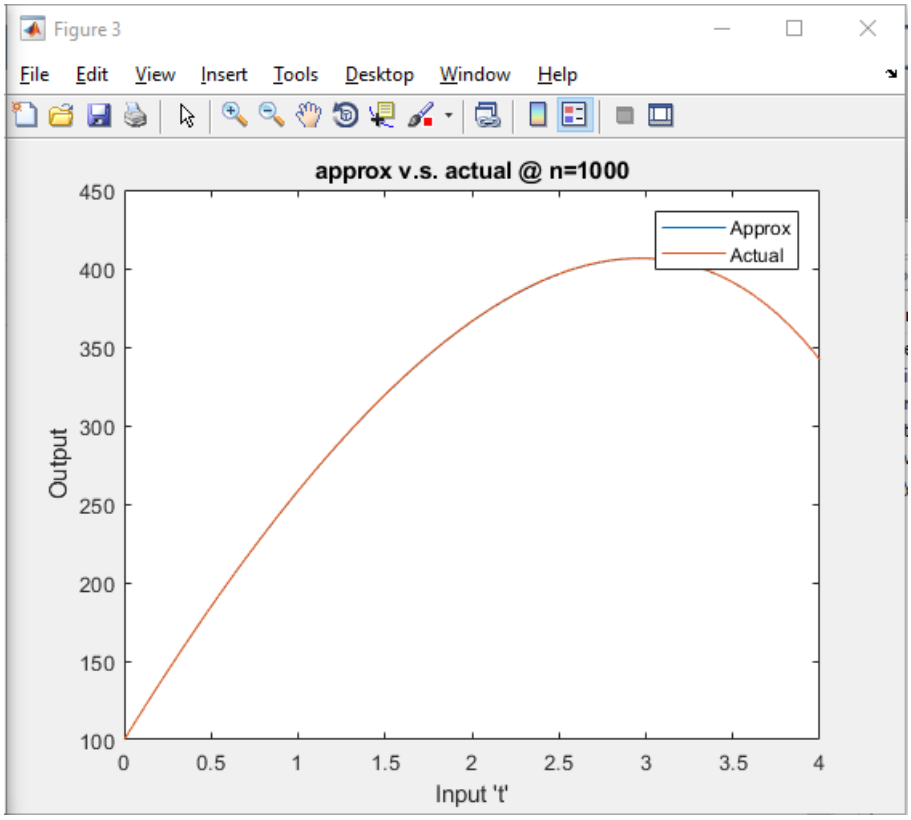


Figure 3
File Edit View Insert Tools Desktop Window Help
approx v.s. actual @ n=1000
Approx
Actual
Output
Input 't'
100
150
200
250
300
350
400
450
0
0.5
1
1.5
2
2.5
3
3.5
4

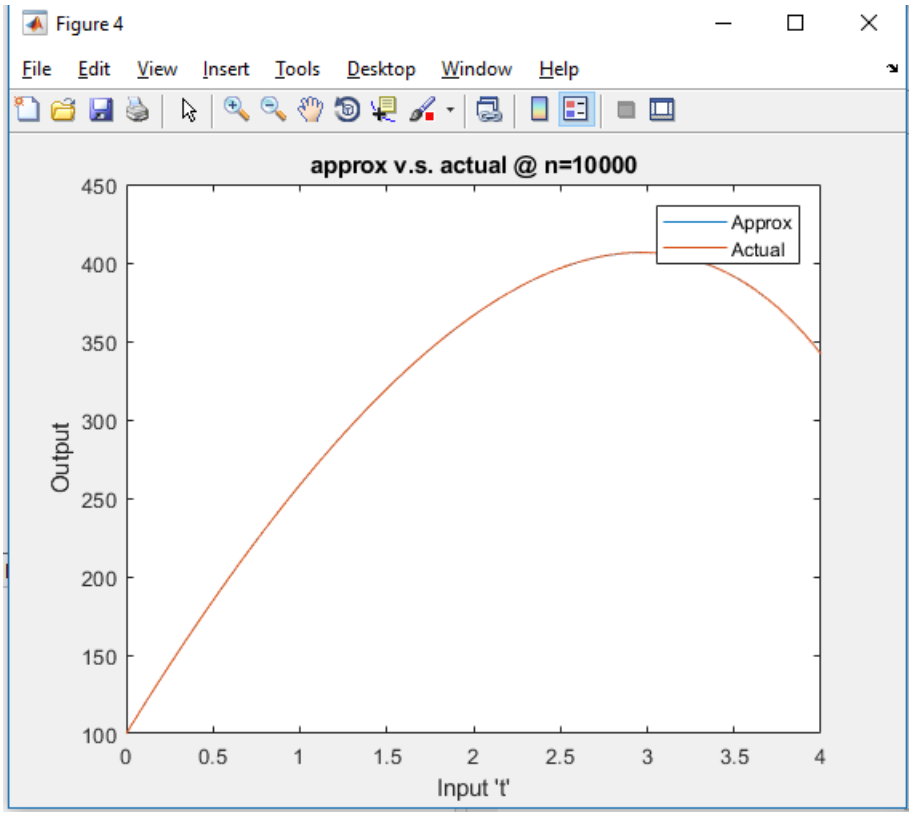


Figure 4
File Edit View Insert Tools Desktop Window Help
approx v.s. actual @ n=10000
Approx
Actual
Output
Input 't'
450
400
350
300
250
200
150
100
0
0.5
1
1.5
2
2.5
3
3.5
4

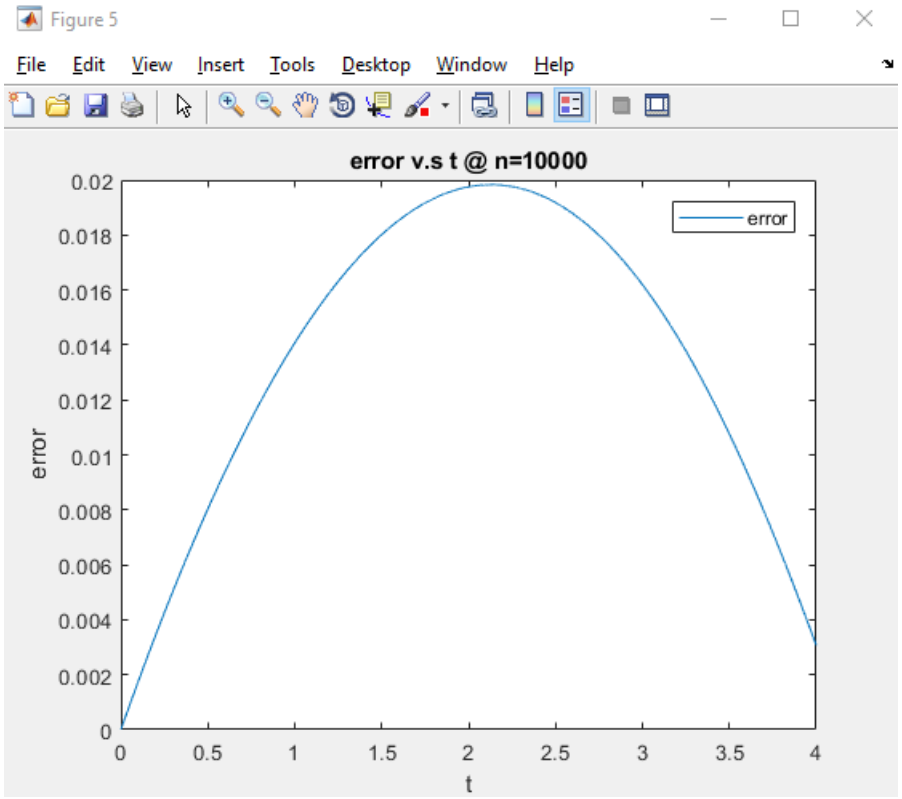


Figure 5
File Edit View Insert Tools Desktop Window Help
error v.s t @ n=10000
error
error
t
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
0
0.5
1
1.5
2
2.5
3
3.5
4