# Finite difference

EX: construct the finite difference table when x is interval from 0 to 1 with step 0.1 and y = e³ˣ up to fourth derivative

| x | y = e³ˣ | $\Delta y_n = y_{n+1} - y_n$ | $\Delta^2 y_n = \Delta y_{n+1} - \Delta y_n$ | $\Delta^3 y_n = \Delta^2 y_{n+1} - \Delta^2 y_n$ | $\Delta^4 y$ ..... |
|---|---|---|---|---|---|
| | | | | | |

```matlab
x=0;
for i = 1:10
x=x+0.1;
y(i)=exp(3*x);
end
disp('y'),y'
for i=1:9
   yy(i) =( y(i+1)-y(i) );        %  yy : represent  Δ y
end
disp('yy'),yy'
for i=1:8
   yy2(i) = (yy(i+1) - yy(i));     %  yy2 : represent Δ y2
end
disp('yy2'),yy2'
for i=1:7
   yy3(i) = (yy2(i+1)- yy2(i));     %  yy3 : represent Δy3
end
disp('yy3'),yy3'
for i=1:6
   yy4(i)= (yy3(i+1)- yy3(i));       %  yy4 : represent Δ y4
end
disp('yy4'),yy4'
```