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```
y0 = 1;

x1 = 0:1/2:3;  % --  16 points
x2 = 0:1/4:3;  % --  13 points
x3 = 0:1/8:3;  % --  25 points
yAnalyticalVal = zeros(1,length(x3))
```

```
yAnalyticalVal =

  Columns 1 through 13

     0     0     0     0     0     0     0     0     0     0     0
 0     0

  Columns 14 through 25

     0     0     0     0     0     0     0     0     0     0     0
  0
```

Analytical part

```
yanalyticalFun =@(x) x - 2 + 3*exp(-x/2);
yAnalyticalVal = yanalyticalFun(x3);
```

```
yAnalyticalVal
```

```
yAnalyticalVal =

  Columns 1 through 7

    1.0000    0.9432    0.8975    0.8621    0.8364    0.8198    0.8119

  Columns 8 through 14

    0.8119    0.8196    0.8343    0.8558    0.8835    0.9171    0.9562

  Columns 15 through 21
```

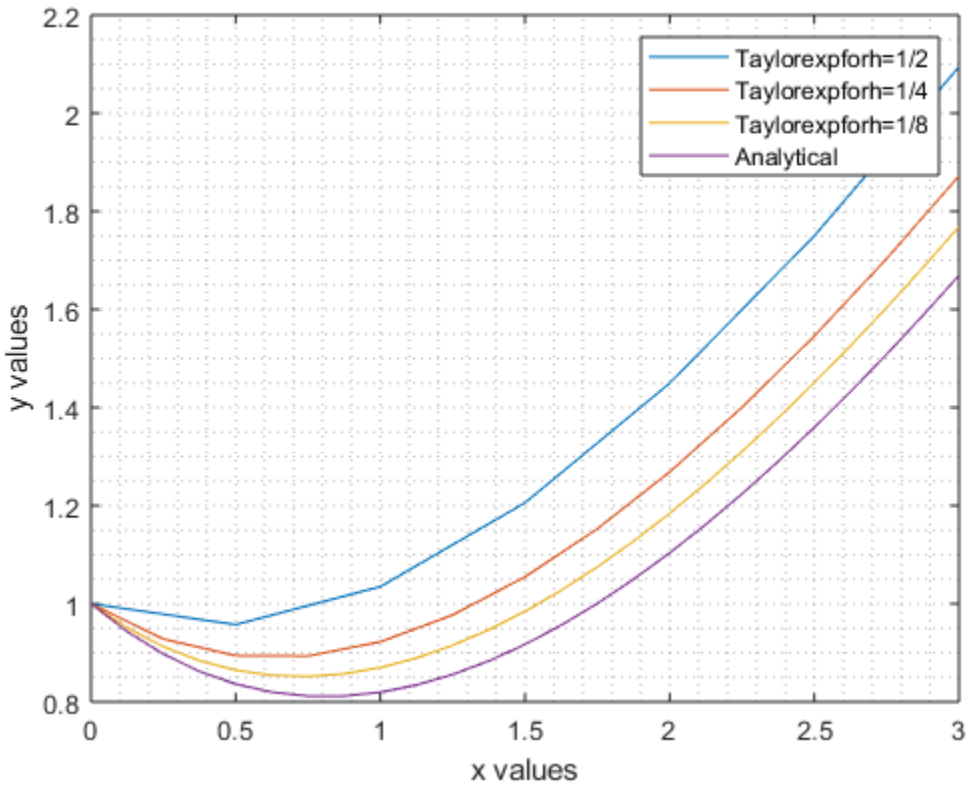
```
    1.0006    1.0498    1.1036    1.1618    1.2240    1.2899    1.3595

  Columns 22 through 25

    1.4324    1.5085    1.5876    1.6694
```

function calls

```
y1 = taylexpan(x1,y0,1/2,length(x1))
y2 = taylexpan(x2,y0,1/4,length(x2))
y3 = taylexpan(x3,y0,1/8,length(x3))
```

Plots

```
plot(x1,y1);
hold on;grid minor;
xlabel('x values')
ylabel('y values')
plot(x2,y2);
plot(x3,y3);
plot(x3,yAnalyticalVal);
legend('Taylorexpforh=1/2','Taylorexpforh=1/4','Taylorexpforh=1/8','Analytical');
hold off;
```



common function for taylor expansion

given fourth order means we need to evaluate till 4th derivate terms only

```
function yeval = taylexpan(x,y0,h,n)

yeval = zeros(1,n);
yeval(1) = y0;

dy =@(x,y) (x-y)./2;
d2y =@(x,y) (-x+y+2)./4;
d3y = @(x,y) (x-y+2)./8;
d4y =@(x,y) (2+y-x)./16;

for i = 2:n
    yeval(i) = y0 + h*dy(x(i),y0) + 1/2*(h.^2)*d2y(x(i),y0) + 1/6 *
 (h.^3) *d3y(x(i),y0)+...
        1/24*(h.^4)*d4y(x(i),y0);
    y0 = yeval(i);
end


end
```

```
y1 =

    1.0000    0.9574    1.0349    1.2058    1.4495    1.7499    2.0944


y2 =

  Columns 1 through 7

    1.0000    0.9282    0.8942    0.8935    0.9223    0.9771    1.0549

  Columns 8 through 13

    1.1528    1.2687    1.4003    1.5458    1.7036    1.8722


y3 =

  Columns 1 through 7

    1.0000    0.9510    0.9125    0.8839    0.8646    0.8541    0.8518

  Columns 8 through 14

    0.8572    0.8698    0.8893    0.9151    0.9470    0.9845    1.0273

  Columns 15 through 21
```

```
    1.0750    1.1275    1.1844    1.2453    1.3102    1.3787    1.4506

  Columns 22 through 25

    1.5258    1.6039    1.6849    1.7686
```

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