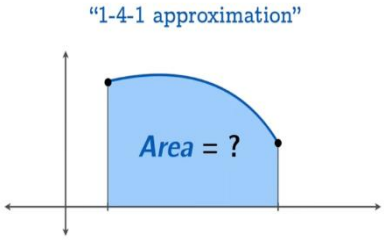
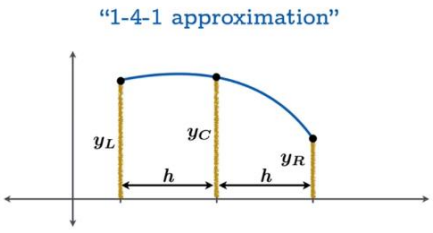
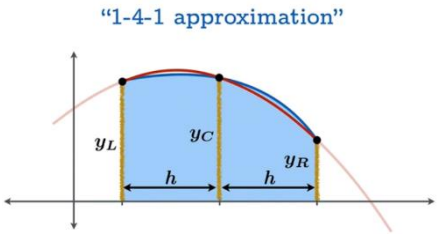
Simpson Method

In **Simpson's Rule**, we will use **parabolas** to approximate each part of the curve. This proves to be very efficient since it's generally more accurate than the other numerical methods we've seen. Simpson's Rule is an algorithm application of (1 – 4 – 1) quadratic approximation.

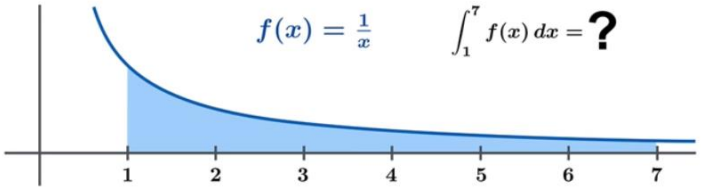


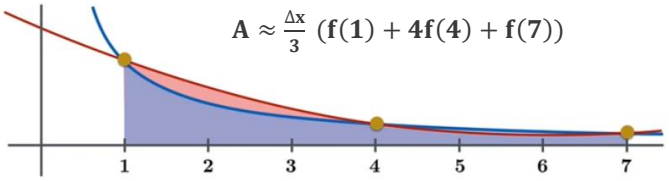




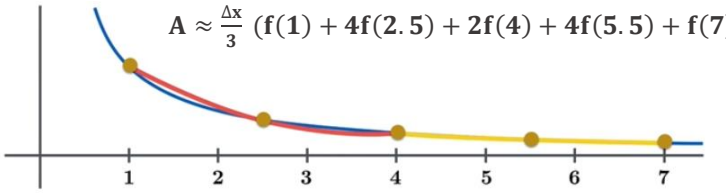
$$\text{Area} \approx \frac{h}{3}(YL + 4YC + YR)$$

Example:

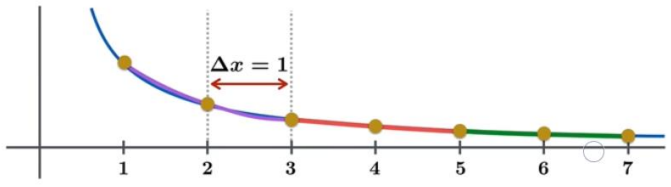




Single use of 1-4-1 method?



Two applications of 1-4-1?



$$\int_1^7 f(x)\,dx \approx \frac{1}{3}\left(f(1)+4f(2)+2f(3)+4f(4)+2f(5)+4f(6)+f(7)\right)$$

$$\approx 1.958730159$$

$$\int_1^7 f(x)\,dx = \int_1^7 \frac{1}{x}\,dx = \ln 7 \approx 1.945910149$$

Simpson Method in MATLAB

```
clc
clear all

f=@(x) 1/x;            % hight
a=input('lower=');
b=input('upper=');
N=input('number of sub=');

h=(b-a)/N;             % width
sum=0;
for i=0:2:N-2
    xn=a+i*h;
    sum=sum+(h/3)*(f(xn)+4*f(xn+h)+f(xn+2*h));
end
fprintf('area= %f \n',sum)
```