1 -

$x = -1.0 \rightsquigarrow f(-1) = 4.5$

$X = 2.0 \rightsquigarrow f(2) = 3.0$

a -

$p(x) = a_0 + a_1 x$ e $D[-1.0, 2.0]$

- Interpolador de 1º grau

x_k	-1.0	2.0
$y_k = f(x_k)$	4.5	3.0

- condição para Interpolação

$$p(x_i) = a_0 + a_1 x = y_i$$

→ restrições:

$p(-1.0) = a_0 + a_1 \cdot (-1)$

$\Rightarrow a_0 - 1a_1 = 4.5$

$p(2) = a_0 + a_1(2)$

$\Rightarrow a_0 + 2a_1 = 3.0$

→ resolvendo

$$\begin{cases} a_0 - a_1 = 4.5 \\ a_0 + 2a_1 = 3.0 \end{cases}$$

$a_0 = 4.5 + a_1$ | $4.5 + a_1 + 2a_1 = 3$

$a_0 = 4.0$ | $a_1 = -0.5$ //

→ Resultado

$p(x) = a_0 + a_1 x$

$p(x) = 4.0 - 0.5x$

b.

→ Via método de Newton

x_k	-1.0	2.0
$y_k = f(x_k)$	$4,5$	3.0

$p_x = b_0 + b_1(x - x_0) +$

x_k	$\Delta^0 y_i$	$\Delta^1 y_i$
-1.0	$4,5$	$-0,5$
2.0	3.0	

→ $p(x) = 4.5 - 0.5(x+1)$

$p(x) = 4.5 - 0.5 - 0.5x$

$p(x) = 4.0 - 0.5x$

\# contas

$\frac{3 - 4,5}{2-(-1)} = \frac{-1,5}{3} = -0,5$ //

$p_x = b_0 + b_1(x - x_0)$

$b_0 = 4,5$

$b_1 = -0,5$

$x_0 = -1$

2.

- Método de Newton
- funcões $1/2x-1$

a)

X_k	1.0	2.5
y_k $f(X_k)$	1.0	0.25

\# calculando

$f(1.0) \rightarrow \frac{1}{2-1} = 1$

$f(2.5) = \frac{1}{2 \cdot 2.5 - 1} = \frac{1}{5-1} = \frac{1}{4} = 0.25$

X_k	$\Delta^0 y_i$	$\Delta^1 y_i$
1.0	1.0	-0.5
2.5	0.25	

$\frac{0.25-1}{2.5-1} = \frac{-0.75}{1.5} = -0.5$

$p(x) = b_0 + b_1(x - x_0)$

$p(x) = 0.25 - 0.5(x-1)$

$p(x) = 0.25 + 1 - 0.5x$

$p(x) = 1.25 - 0.5x$

$\rightarrow p(x) = 1.25 - 0.5x$

b) Usando forma de Newton

• Interpolação 2º grau • função $1/(2x-1)$

• pontos

$f(1.0) = \frac{1}{2.1-1} = 1$ = $f(1.75) = \frac{1}{2.(1.75)-1} = 0.4$ = $f(2.5) = 0.25$

x_k =	1.0	1.75	2.5
y_k $f(x_k)$ =	1.0	0.4	0.25

x_k	$\Delta^0 y_i$	$\Delta^1 y_i$	$\Delta^2 y_0$
1.0	1.0	−0.8	0.66667
1.75	0.4	0.2	
2.5	0.25		

contas

$\left.\frac{0.4-1}{1.75-1} = -0.8 \qquad \frac{0.25-0.4}{2.5-1.75} = 0.2\right\} \Delta^1 y_i$

$\left.\frac{0.2-(-0.8)}{2.5-1} = 0.66667\right\} \Delta^2 y_0$ $0.8 = \frac{4}{5}$ e $0.6667 = \frac{2}{3}$

$p(x) = b_0 + b_1(x-x_0) + b_2(x-x_0)(x-x_1)$

$\rightarrow x^2 - 1.75x - x + 1.75$

$p(x) = 1 + -0.8(x-1) + 0.66667(x-1)(x-1.75)$

$P(x) = 1 - \frac{4}{5}(x-1) + \frac{2}{3}(x^2 - 2.75x + 1.75)$ //

P(x)

c)

- Método de Newton $1/(2.x-1)$

Calculando pontos

$f(1.0) = 1$ // $f(1.5) = \frac{1}{(2.1,5)-1} = 0,5$ // $f(2.0) = \frac{1}{2.2-1} = 0.3333$

$f(2.5) = 0.25$ //

x_k =	1.0	1.5	2.0	2.5
$x_k f(x_k)$ =	1.0	0.5	0.3333	0.25

x_k	$\Delta^0 y_i$	$\Delta^1 y_i$	$\Delta^2 y_i$	$\Delta^3 y_i$
1.0	1.0	-1.0	0.6666	-2 //
1.5	0.5	-0.3334	-1,3332	
2.0	0.3333	-1,666		
2.5	0.25			

contas

$\frac{0.5-1}{1.5-1} = -1$; $\frac{0.3333-0.5}{2-1.5} = -0.3334$; $\frac{0.25-0.3333}{2.5-2} = -0,1666$ } Δ^1

$\frac{-0.3334-(-1)}{2-1} = 0,6666$; $\frac{-1,666-(-0.3334)}{2.5-1.5} = -1,3332$

$\frac{-1.3332-0.6666}{2.5-1} = -2$

... continuando

$b_0 = 1$

$b_1 = -1$

$b_2 = 0{,}6666 = 2/3$

$b_3 = -2$

$x_0 = 1.0$

$x_1 = 1{,}5$

$x_2 = 2.0$

$x_3 = 2.5$

$$P_3(x) = b_0 + b_1(x - x_0) + b_2(x - x_0)(x - x_1) + b_3(x - x_0)(x - x_1)(x - x_2)$$

$$P_3(x) = 1 + (-1)(x-1) + \frac{2}{3}(x-1)(x-1{,}5) + (-2)(x-1)(x-1{,}5)(x-2)$$

d - Metodo trapézio $\int_{1.0}^{2,5} \frac{1}{2x-1} dx = 1 \cdot (2x-1)^{-1}$

$h = b - a = 2.5 - 1 = 1.5$ $x_1 = 1.0$ $x_2 = 2.5$

$I_T = \frac{h}{2} [f(x_1) + f(x_2)]$ $\int_a^b (2x-1)^{-1} dx \cong 0.69314$

$I_T = \frac{1.5}{2} [1 + 0.25]$

$I_T = 0,9375$

$f(x_1) = \frac{1}{2 \cdot 1 - 1} = 1$

$f(x_2) \frac{1}{(2 \cdot 2.5) - 1} = 0.25$

$\frac{}{(2 \cdot 2.5) - 1} = 0.$

2) - 1/3 simpson $\int_{1.0}^{2.5} \frac{1}{2x-1} \, dx$

$x_3 = 2.5$ $x_1 = 1.0$

$h = \frac{x_3 - x_1}{2} = \frac{2.5 - 1}{2} = \frac{1.5}{2} = 0.75$

$x_2 = x_1 + h$

$x_2 = 1 + 0.75$

$x_2 = 1.75$

$$I_s = \frac{h}{3} \left[f(x_1) + 4 f(x_2) + f(x_3) \right]$$

$f(x_1) = 1$

$f(x_2) = \frac{1}{(2 \cdot 1.75) - 1} = 0.4$

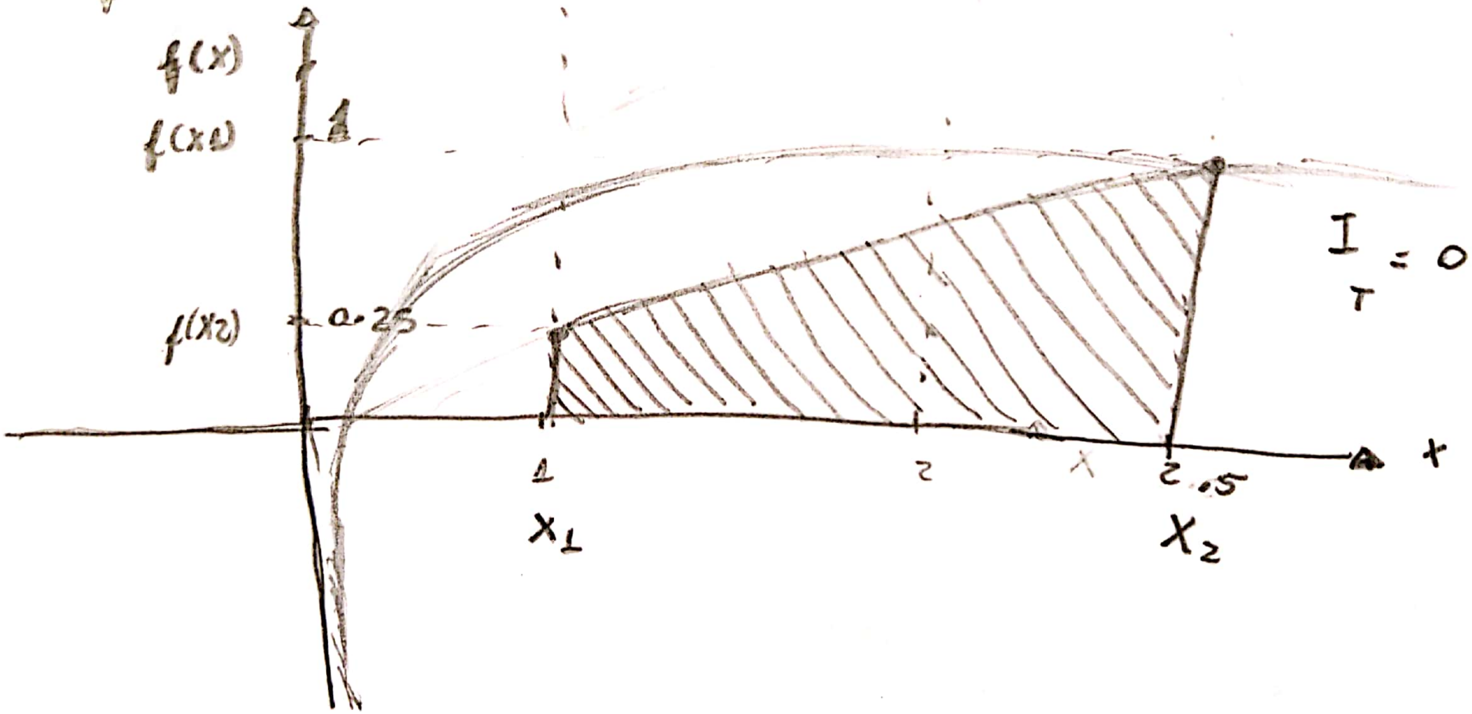
$$I_s = \frac{0.75}{3} \left[1 + 4 \cdot (0.4) + 0.25 \right]$$

$f(x_3) = 0.25$

$$\boxed{I_s = 0{,}7125}$$

Valor real $= \ln(2) \cong 0.69314$

4- Trapézia



$$f(x) = \frac{1}{2x-1}$$

$$= \ln(x)$$

$$I_T = 0.9375$$

$$\begin{cases} x_1 = 1 \\ x_2 = 2.5 \end{cases}$$

$$\begin{cases} f(x_1) = 1 \\ f(x_2) = 0.25 \end{cases}$$

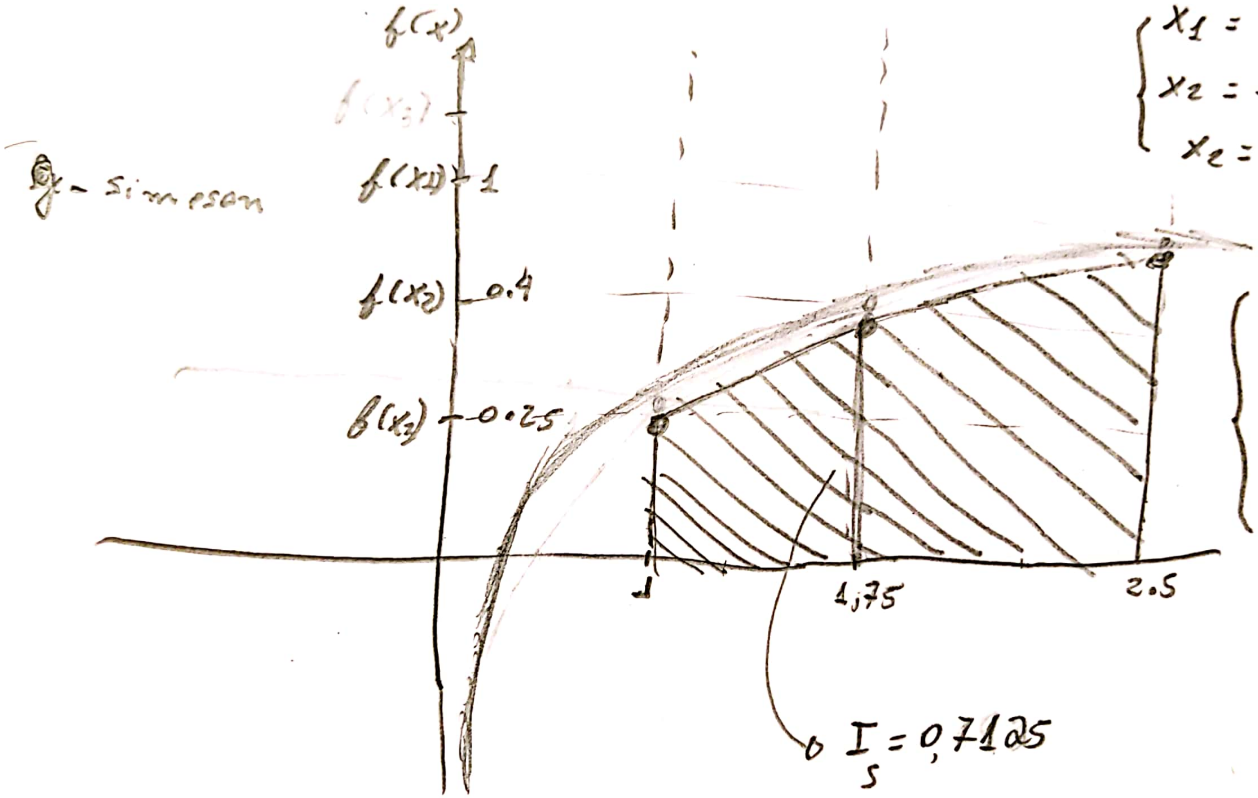
$\frac{1}{x-1} = \ln(x)$ } Integral $\ln(2) \approx 0.69314$

$x_1 = 1$

$f(x_3) = 0.25$

$\frac{1}{x-1} = \ln(x)$ } Integral $\ln(2) \approx 0.69314$

$\begin{cases} x_1 = 1 \\ x_2 = 1.75 \\ x_3 = 2.5 \end{cases}$



$\begin{cases} f(x_1) = 1 \\ f(x_2) = 0.4 \\ f(x_3) = 0.25 \end{cases}$

regra de simpson Foi mais proximo do valor real

valor real = $0.69314 \rightarrow I_s = 0.7125$

b) Integrando

$$I_1 = \int_1^{2,5} P_3(x) \rightsquigarrow 1-(x-1)+\frac{2}{3}(x-1)(x-1,5)-2(x-1)(x-1,5)(x-2)$$

$$I_1 = \int_1^{2,5} 1\,dx = 1,5$$

$$I_2 = \int_1^{2,5} -(x-1)\,dx = -1,125$$

$$I_3 \int_1^{2,5} \frac{2}{3}(x-1)(x-1,5) = \frac{2}{3}\int_1^{2,5}(x^2-2,5x+1,5) = 0.375$$

$$I_4 = \int_1^{2,5} -2(x-1)(x-1,5)(x-2) = -2\int_1^{2,5}(x^3-4,5x^2+6,5x-3) = -0,28125$$

somando

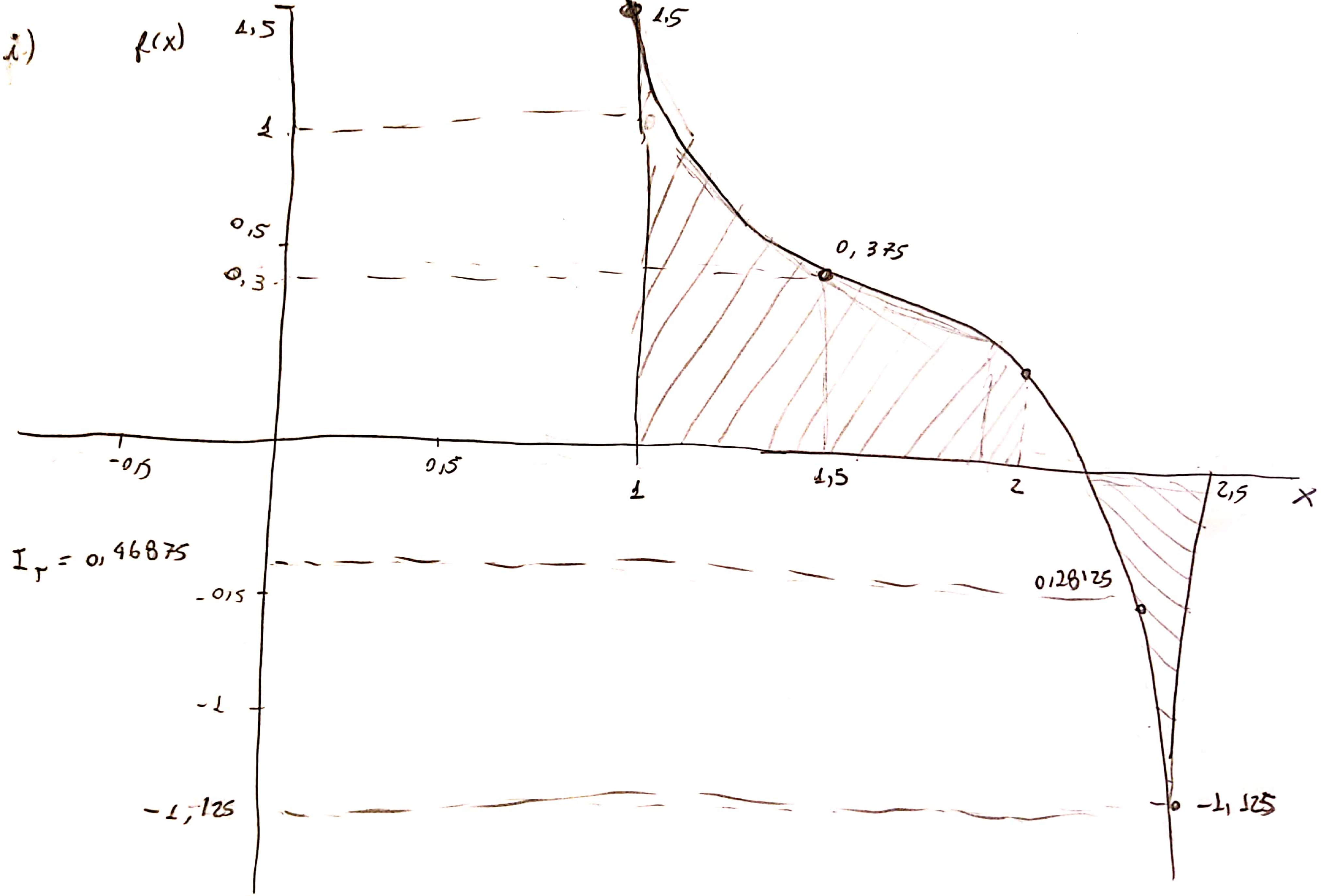
$$I_T = I_1 + I_2 + I_3 + I_4$$

$$I_T = 1,5 - 1,125 + 0.375 - 0.28125$$

$$I_T = 0,46875$$

Digitalizado com CamScanner

i)



$I_T = 0,46875$

```matlab

function I=simpson(f,a,b,N)

%f=@(x)sqrt(x);
%a=1;
%b=3;
%N=10;
h=(b-a)/N;
s=f(a)+f(b);

for k=1:2:(N-1)
    x=a+h*k;
    s=s+4*f(x);
end

for k=2:2:(N-2)
    x=a+h*k;
    s=s+2*f(x);
end

I=(h*s)/3;
```

Arquivo Editar Depurar Janela Ajuda Novidades

Diretório Atual: C:\Users\diona

Navegador de Arquivos

C:/Users/diona

Nome
VirtualBox VMs
Videos
source
Searches
Saved Games
OneDrive

Ambiente de Trabalho

Nome	Classe
I	double
N	double
a	double
b	double
f	function_ha

Histórico de Comandos

Filtrar

S=interpolNewton(x

Janela de Comandos

```
>> f=@(x)sqrt(x);
>> a=1;
>> b=3;
>> N=10;
>> I=simpson(f,a,b,N)
I = 2.7974
>> 
```

```
function I=simpson(f,a,b,N)

%f=@(x)sqrt(x);
%a=1;
%b=3;
%N=2;
h=(b-a)/N;
s=f(a)+f(b);

for k=1:2:(N-1)
    x=a+h*k;
    s=s+4*f(x);
end

for k=2:2:(N-2)
    x=a+h*k;
    s=s+2*f(x);
end

I=(h*s)/3;
```

/diona/OneDrive/Área de Trabalho/Ras

Nome
unknown (5).png
unknown (4).png
unknown (3).png
unknown (2).png
unknown (1).png
simpson.m

Ambiente de Trabalho

Nome	Classe	Dimensão
I	double	1x1
N	double	1x1
a	double	1x1
b	double	1x1
f	function_handle	1x1

Histórico de Comandos

Filtrar

```
S=interpolNewton(x0,xi,yi)
interpolNewton
S=interpolNewton(x0,xi,yi)
xi=[1 1.5 2 2.5]
x0=1
yi=[1 0.5 0.3333 0.25]
S=interpolNewton(x0,xi,yi)
```

```
>> I=simpson(f,a,b,
I = 2.7963
>>
```