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Teknik Informatika

Analisis Numerik – **Interpolasi**

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xi	1	2	4
yi	0.5403	-0.4161	-0.6536

1. Buat polinom dari data tersebut :

   a. Lagrange :

$$p2(x)=a0L0(x)+a1L1(x)+a2L2(x)$$

$$p2(x)=y0\frac{(x-x1)(x-x2)}{(x0-x1)(x0-x2)}+y1\frac{(x-x0)(x-x2)}{(x1-x0)(x1-x2)}+y2\frac{(x-x0)(x-x1)}{(x2-x0)(x2-x1)}$$

$$p2(x)=0.5403\frac{(x-2)(x-4)}{(1-2)(1-4)}+-0.4161\frac{(x-1)(x-4)}{(2-1)(2-4)}+-0.6536\frac{(x-1)(x-2)}{(4-1)(4-2)}$$

$$p2(x)=0.5403\frac{(x-2)(x-4)}{3.0}+-0.4161\frac{(x-1)(x-4)}{-2.0}+-0.6536\frac{(x-1)(x-2)}{6.0}$$

$$p2(x)=0.1801(x-2)(x-4)+0.2081(x-1)(x-4)+-0.1089(x-1)(x-2)$$

   b. Newton :

i	**xi**	**yi**	**ST-1**	**ST-2**
0	1	0.5403	f[x1, x0]	f[x2, x1, x0]
1	2	-0.4161	f[x2, x1]	
2	4	-0.6536		

$$f[x1,x0]=\frac{f(x1)-f(x0)}{x1-x0}=\frac{-0.4161-0.5403}{2-1}=-0.9564$$
$$f[x2,x1]=\frac{f(x2)-f(x1)}{x2-x1}=\frac{-0.6536-(-0.4161)}{4-2}=-0.1187$$

i	**xi**	**yi**	**ST-1**	**ST-2**
0	1	0.5403	-0.9564	f[x2, x1, x0]
1	2	-0.4161	-0.1187	
2	4	-0.6536		

$$f[x2,x1,x0]=\frac{f[x2,x1]-f[x1,x0]}{x2-x0}=\frac{-0.1187-(-0.9564)}{4-1}=0.2792$$

i	xi	yi	ST-1	ST-2
0	1	0.5403	-0.9564	0.2792
1	2	-0.4161	-0.1187	
2	4	-0.6536		

$$p2(x)=a0+a1(x-x0)+a2(x-x0)(x-x1)$$

$$p2(x)=0.5403+-0.9564(x-1)+0.2792(x-1)(x-2)$$

2. Hitung nilai hampiran pada titik 3 dan 2.5 **(P2(3)** dan **P2(2.5)**

a. Lagrange :

Hitung P2(3)

$$p2(3)=0.1801(3-2)(3-4)+0.2081(3-1)(3-4)+-0.1089(3-1)(3-2)$$

$$p2(3)=0.1801(1)(-1)+0.2081(2)(-1)+-0.1089(2)(1)$$

$$p2(3)=0.1801(-1)+0.2081(-2)+-0.1089(2)$$

$$p2(3)=-0.1801+-0.4162+-0.2178$$

$$p2(3)=-0.8141$$

Hitung P2(2.5)

$$p2(2.5)=0.1801(2.5-2)(2.5-4)+0.2081(2.5-1)(2.5-4)+-0.1089(2.5-1)(2.5-2)$$

$$p2(2.5)=0.1801(0.5)(-1.5)+0.2081(1.5)(-1.5)+-0.1089(1.5)(0.5)$$

$$p2(2.5)=0.1801(-0.75)+0.2081(-2.25)+-0.1089(0.75)$$

$$p2(2.5)=-0.1351+-0.4682+-0.0817$$

$$p2(2.5)=-0.685$$

b. Newton :

Hitung P2(3)

$$p2(3)=0.5403+-0.9564(3-1)+0.2792(3-1)(3-2)$$

$$p2(3)=0.5403+-0.9564(2)+0.2792(2)(1)$$

$$p2(3)=0.5403+-1.9128+0.5584$$

$$p2(3)=-0.8141$$

Hitung P2(2.5)

$$p2(2.5)=0.5403+-0.9564(2.5-1)+0.2792(2.5-1)(2.5-2)$$

$$p2(2.5)=0.5403+-0.9564(1.5)+0.2792(1.5)(0.5)$$

$$p2(2.5)=0.5403+-1.4346+0.2094$$

$$p2(2.5)=-0.685$$

3. Jika diberikan data tambahan yaitu (3, -0.9900) dengan **polinom Newton**

xi	1	2	4	3
yi	0.5403	-0.4161	-0.6536	-0.9900

i	**xi**	**yi**	**ST-1**	**ST-2**	**ST-3**
0	1	0.5403	f[x1, x0]	f[x2, x1, x0]	f[x3, x2, x1, x0]
1	2	-0.4161	f[x2, x1]	f[x3, x2, x1]	
2	4	-0.6536	f[x3, x2]		
3	3	-0.9900			

$$f[x1,x0]=\frac{f(x1)-f(x0)}{x1-x0}=\frac{-0.4161-0.5403}{2-1}=-0.9564$$

$$f[x2,x1]=\frac{f(x2)-f(x1)}{x2-x1}=\frac{-0.6536-(-0.4161)}{4-2}=-0.1187$$

$$f[x3,x2]=\frac{f(x3)-f(x2)}{x3-x2}=\frac{-0.9900-(-0.6536)}{3-4}=0.3364$$

i	**xi**	**yi**	**ST-1**	**ST-2**	**ST-3**
0	1	0.5403	-0.9564	f[x2, x1, x0]	f[x3, x2, x1, x0]
1	2	-0.4161	-0.1187	f[x3, x2, x1]	
2	4	-0.6536	0.3364		
3	3	-0.9900			

$$f[x2,x1,x0]=\frac{f[x2,x1]-f[x1,x0]}{x2-x0}=\frac{-0.1187-(-0.9564)}{4-1}=0.2792$$

$$f[x3,x2,x1]=\frac{f[x3,x2]-f[x2,x1]}{x3-x1}=\frac{0.3364-(-0.1187)}{3-4}=0.4551$$

i	**xi**	**yi**	**ST-1**	**ST-2**	**ST-3**
0	1	0.5403	-0.9564	0.2792	f[x3, x2, x1, x0]
1	2	-0.4161	-0.1187	0.4551	
2	4	-0.6536	0.3364		
3	3	-0.9900			

$$f[x3,x2,x1,x0]=\frac{f[x3,x2,x1]-f[x2,x1,x0]}{x3-x0}=\frac{0.2792-0.4551}{3-1}=0.088$$

i	xi	yi	ST-1	ST-2	ST-3
0	1	0.5403	-0.9564	0.2792	0.088
1	2	-0.4161	-0.1187	0.4551	
2	4	-0.6536	0.3364		
3	3	-0.9900			

$$p3(x)=a0+a1(x-x0)+a2(x-x0)(x-x1)+a3(x-x0)(x-x1)(x-x2)$$

$$p3(3)=0.5403+-0.9564(x-1)+0.2792(x-1)(x-2)+0.088(x-1)(x-2)(x-4)$$

Hitung P3(3)

$$p3(3)=0.5403+-0.9564(3-1)+0.2792(3-1)(3-2)+0.088(3-1)(3-2)(3-4)$$

$$p3(3)=0.5403+-0.9564(2)+0.2792(2)(1)+0.088(2)(1)(-1)$$

$$p3(3)=0.5403+-1.9128+0.5584+-0.1759$$

$$p3(3)=-0.99$$

Hitung P3(2.5)

$$p3(2.5)=0.5403+-0.9564(2.5-1)+0.2792(2.5-1)(2.5-2)+0.088(2.5-1)(2.5-2)(2.5-4)$$

$$p3(2.5)=0.5403+-0.9564(1.5)+0.2792(1.5)(0.5)+0.088(1.5)(0.5)(-1.5)$$

$$p3(2.5)=0.5403+-1.4346+0.2094+-0.099$$

$$p3(2.5)=-0.7839$$