Контрольна робота

Півень Денис ОМ-3

Варіант 2

1) $\int_0^5 (x^3+3x^2+3)\,dx$, $h=1$, лівих прям. //296,

$$\int_0^5 (x^3+3x^2+3)\,dx \approx \sum_{k=1}^{5}\int_{x_{k-1}}^{x_k} f(x_{k-1})\,dx \approx f(x_0)+\ldots f(x_4) =$$

$$= 3+7+23+57+115 = 205 = I_h$$

$$I_{\frac{h}{2}} = \frac{h}{2}\sum_{k=1}^{n} f(x_{k-\frac{1}{2}}) + \frac{1}{2}I_h = 68.5 + 102,5 = 171.$$

$$I_{\frac{h}{4}} = \frac{1}{2}\sum_{k=1}^{n} f(x_{k-\frac{1}{4}}) + \frac{1}{2}I_{\frac{h}{2}} = 126,375$$

$$\cancel{\frac{I_{\frac{h}{2}} - I_h}{I_{\frac{h}{4}} - I_{\frac{h}{2}}}\approx 2} \qquad |I_h - I_{\frac{h}{4}}| \leq \frac{|205-126,375|}{2^4-1} \leq 5.24.$$

2) $x^4+2x^3+4x = f(x)$ $\qquad$ 0, 1, 2, 3

x	$f(x)$			
0	0			
		7		
1	7		13	
		33		8
2	40		37	
		107		
3	147			

$$P_3(x) = 7(x-1) + 13(x-1)(x-2) + 8(x-1)(x-2)(x-3) =$$

$$= 8x^3 - 35x^2 + 56x - 29.$$

3) $$\frac{\partial^3 u}{\partial y^3} + 2\frac{\partial^2 u}{\partial y^2} \cdot \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 0 \quad , \qquad O(h^2)$$

$$\frac{\partial^3 u}{\partial y^3} = \frac{u(x, y+2h) - 2u(x, y+h) + \cancel{u(x,y)} - \cancel{u(x,y)} + 2u(x, y-h) - u(x, y-2h)}{2h^2}$$

$$\frac{\partial^2 u}{\partial y^2} = \frac{u(x, y+h) - 2u(x,y) + u(x, y-h)}{h^2}$$

$$\frac{\partial u}{\partial x} = \frac{u(x+h, y) - u(x-h, y)}{2h}$$

$$\frac{\partial u}{\partial y} = \frac{u(x, y+h) - u(x, y-h)}{2h}$$