Вариант 5 Задача 2 Киселева Кс. 3821Б1ПМоп2

x	0,3	0,4	0,6
f(x)	1,04534	1,08107	1,18547

$f(x) = ch(x)$

1) $\widetilde{P}_2(x) = 1{,}04534 \frac{(x-0{,}4)(x-0{,}6)}{(0{,}3-0{,}4)(0{,}3-0{,}6)} + 1{,}08107 \frac{(x-0{,}3)(x-0{,}6)}{(0{,}4-0{,}3)(0{,}4-0{,}6)} +$

$+ 1{,}12763 \frac{(x-0{,}3)(x-0{,}4)}{(0{,}6-0{,}3)(0{,}6-0{,}4)}$

2) $P(0{,}35) = 1{,}04534 \frac{0{,}05(-0{,}25)}{-0{,}1(-0{,}3)} + 1{,}08107 \frac{0{,}05(-0{,}25)}{0{,}1(-0{,}2)} + 1{,}12763 \frac{(0{,}05)(-0{,}05)}{0{,}3 \cdot 0{,}2}$

$\approx -0{,}435558 + 0{,}675669 - 0{,}0469846 = 0{,}193184$

3) $r_n(x) = \frac{f^{(n+1)}(\xi(x))}{(n+1)!} \cdot (x-x_0)(x-x_1)\dots(x-x_n)$

$r_2(x) = \frac{f'''(\xi(x))}{6}(x-0{,}3)(x-0{,}4)(x-0{,}6) = \frac{sh(\xi(x))}{6}(x-0{,}3)(x-0{,}4)(x-0{,}6) \le$

max произв — Find Maximum (Wolfram)

$\le \frac{1}{6} \max\limits_{[0{,}3;0{,}6]} |sh(x)| \max\limits_{[0{,}3;0{,}6]} |(x-0{,}3)(x-0{,}4)(x-0{,}6)| \approx \frac{1}{6} sh(0{,}6) \cdot 0{,}0063113 \approx$

$\approx 0{,}000669685 \sim 6{,}6985 \cdot 10^{-4}$

$r_n(x^*) = f(x^*) - P_n(x^*)$ – погрешн. интерполяции точки

$ВП(x^*) = P_n(x^*) - \widetilde{P}_n(x^*)$ – погрешн. вычисленная в точке

$ВП(x) = (ch(0{,}3) - 1{,}04534) \frac{(x-0{,}4)(x-0{,}6)}{0{,}03} + (ch(0{,}4) - 1{,}08107) \frac{(x-0{,}3)(x-0{,}6)}{-0{,}02} +$

$+ (ch(0{,}6) - 1{,}18547) \frac{(x-0{,}3)(x-0{,}4)}{0{,}06} \le 0{,}5 \cdot 10^{-5} \max\limits_{[0{,}3;0{,}6]} |\dots| = 0{,}5 \cdot 10^{-5}$

$ОП_n(x^*) = f(x) - \widetilde{P}_n(x) = r_n(x^*) + ВП_n(x^*)$

$ОП_n(x^*) \le 6{,}6985 \cdot 10^{-4} + 0{,}5 \cdot 10^{-5} = 6{,}7485 \cdot 10^{-4}$

Задача 3

$f(x) = e^{-x^2}$

x	1,0	1.2	1.4	1,6	1,8
f(x)	0,36788	0,23693	0,14086	0,07730	0,03916

$\delta = 0{,}5 \cdot 10^{-5}$

$r_4(x) = \frac{f^V}{5!}(x-1)(x-1{,}2)(x-1{,}4)(x-1{,}6)(x-1{,}8) = \left| \frac{8x(-4x^4+20x^2-15)e^{-x^2}}{120} \right| \cdot \max_{[1;1{,}8]}$

$\cdot \max_{[1;1{,}8]} |(x-1)(x-1{,}2)(x-1{,}4)(x-1{,}6)(x-1{,}8)| \leq \left(\frac{3{,}26407687}{100} \cdot 0{,}00116206 \approx \right.$

$\approx 3{,}793053 \cdot 10^{-5}$

$\Theta \Pi_4(x) \leq 3{,}793053 \cdot 10^{-5} + 0{,}5 \cdot 10^{-5} = 4{,}293053 \cdot 10^{-5}$