

3.1. Используя таблицу значений Y_i функции $y = f(x)$, вычисленных в точках X_i , $i = 0, \dots, 3$ построить интерполяционные многочлены Лагранжа и Ньютона, проходящие через точки $\{X_i, Y_i\}$. Вычислить значение погрешности интерполяции в точке X^* .

1. $y = \sin(x)$, а) $X_i = 0.1\pi, 0.2\pi, 0.3\pi, 0.4\pi$; б) $X_i = 0.1\pi, \frac{\pi}{6}, 0.3\pi, 0.4\pi$; $X^* = \frac{\pi}{4}$.
2. $y = \cos(x)$, а) $X_i = 0, \frac{\pi}{6}, \frac{2\pi}{6}, \frac{3\pi}{6}$; б) $X_i = 0, \frac{\pi}{6}, \frac{5\pi}{12}, \frac{\pi}{2}$; $X^* = \frac{\pi}{4}$.
3. $y = \operatorname{tg}(x)$, а) $X_i = 0, \frac{\pi}{8}, \frac{2\pi}{8}, \frac{3\pi}{8}$; б) $X_i = 0, \frac{\pi}{8}, \frac{\pi}{3}, \frac{3\pi}{8}$; $X^* = \frac{3\pi}{16}$.
4. $y = \operatorname{ctg}(x)$, а) $X_i = \frac{\pi}{8}, \frac{2\pi}{8}, \frac{3\pi}{8}, \frac{4\pi}{8}$; б) $X_i = \frac{\pi}{8}, \frac{5\pi}{16}, \frac{3\pi}{8}, \frac{\pi}{2}$; $X^* = \frac{\pi}{3}$.
5. $y = \ln(x)$, а) $X_i = 0.2, 0.6, 1.0, 1.4$; б) $X_i = 0.2, 0.6, 1.0, 1.4$; $X^* = 0.8$.
6. $y = e^x$, а) $X_i = -2, -1, 0, 1$; б) $X_i = -2, -1, 0.2, 1$; $X^* = -0.5$.
7. $y = \sqrt{x}$, а) $X_i = 0, 1.7, 3.4, 5.1$; б) $X_i = 0, 1.7, 4.0, 5.1$; $X^* = 3.0$.
8. $y = \arcsin(x)$, а) $X_i = -0.4, -0.1, 0.2, 0.5$; б) $X_i = -0.4, 0, 0.2, 0.5$; $X^* = 0.1$.
9. $y = \arccos(x)$, а) $X_i = -0.4, -0.1, 0.2, 0.5$; б) $X_i = -0.4, 0, 0.2, 0.5$; $X^* = 0.1$.
10. $y = \operatorname{arctg}(x)$, а) $X_i = -3, -1, 1, 3$; б) $X_i = -3, 0, 1, 3$; $X^* = -0.5$.
11. $y = \operatorname{arcctg}(x)$, а) $X_i = -3, -1, 1, 3$; б) $X_i = -3, 0, 1, 3$; $X^* = -0.5$.
12. $y = \sin(x) + x$, а) $X_i = 0, \frac{\pi}{6}, \frac{2\pi}{6}, \frac{3\pi}{6}$; б) $X_i = 0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{2}$; $X^* = 1.0$.
13. $y = \cos(x) + x$, а) $X_i = 0, \frac{\pi}{6}, \frac{2\pi}{6}, \frac{3\pi}{6}$; б) $X_i = 0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{2}$; $X^* = 1.0$.
14. $y = \operatorname{tg}(x) + x$, а) $X_i = 0, \frac{\pi}{8}, \frac{2\pi}{8}, \frac{3\pi}{8}$; б) $X_i = 0, \frac{\pi}{8}, \frac{\pi}{3}, \frac{3\pi}{8}$; $X^* = \frac{3\pi}{16}$.
15. $y = \operatorname{ctg}(x) + x$, а) $X_i = \frac{\pi}{8}, \frac{2\pi}{8}, \frac{3\pi}{8}, \frac{4\pi}{8}$; б) $X_i = \frac{\pi}{8}, \frac{\pi}{3}, \frac{3\pi}{8}, \frac{\pi}{2}$; $X^* = \frac{3\pi}{16}$.
16. $y = \ln(x) + x$, а) $X_i = 0.1, 0.5, 0.9, 1.3$; б) $X_i = 0.1, 0.5, 1.1, 1.3$; $X^* = 0.8$.
17. $y = e^x + x$, а) $X_i = -2, -1, 0, 1$; б) $X_i = -2, -1, 0.2, 1$; $X^* = -0.5$.
18. $y = \sqrt{x} + x$, а) $X_i = 0, 1.7, 3.4, 5.1$; б) $X_i = 0, 1.7, 4.0, 5.1$; $X^* = 3.0$.
19. $y = \arcsin(x) + x$, а) $X_i = -0.4, -0.1, 0.2, 0.5$; б) $X_i = -0.4, 0, 0.2, 0.5$; $X^* = 0.1$.
20. $y = \arccos(x) + x$, а) $X_i = -0.4, -0.1, 0.2, 0.5$; б) $X_i = -0.4, 0, 0.2, 0.5$; $X^* = 0.1$.

21. $y = \arctg(x) + x$, а) $X_i = -3, -1, 1, 3$; б) $X_i = -3, 0, 1, 3$; $X^* = -0.5$.
22. $y = \text{arccctg}(x) + x$, а) $X_i = -3, -1, 1, 3$; б) $X_i = -3, 0, 1, 3$; $X^* = -0.5$.
23. $y = \frac{1}{x}$, а) $X_i = 0.1, 0.5, 0.9, 1.3$; б) $X_i = 0.1, 0.5, 1.1, 1.3$; $X^* = 0.8$.
24. $y = \frac{1}{x^2}$, а) $X_i = 0.1, 0.5, 0.9, 1.3$; б) $X_i = 0.1, 0.5, 1.1, 1.3$; $X^* = 0.8$.
25. $y = \frac{1}{x} + x$, а) $X_i = 0.1, 0.5, 0.9, 1.3$; б) $X_i = 0.1, 0.5, 1.1, 1.3$; $X^* = 0.8$.
26. $y = \frac{1}{x^2} + x^2$, а) $X_i = 0.1, 0.5, 0.9, 1.3$; б) $X_i = 0.1, 0.5, 1.1, 1.3$; $X^* = 0.8$.
27. $y = x \sin(x)$, а) $X_i = 0, \frac{\pi}{6}, \frac{2\pi}{6}, \frac{3\pi}{6}$; б) $X_i = 0, \frac{\pi}{6}, \frac{5\pi}{12}, \frac{\pi}{2}$; $X^* = \frac{\pi}{4}$.
28. $y = x \cos(x)$, а) $X_i = 0, \frac{\pi}{6}, \frac{2\pi}{6}, \frac{3\pi}{6}$; б) $X_i = 0, \frac{\pi}{6}, \frac{5\pi}{12}, \frac{\pi}{2}$; $X^* = \frac{\pi}{4}$.
29. $y = xe^x$, а) $X_i = -2, -1, 0, 1$; б) $X_i = -2, -1, 0.2, 1$; $X^* = -0.5$.
30. $y = x^2 e^x$, а) $X_i = -1.2, -0.7, -0.2, 0.3$; б) $X_i = -1.2, -0.7, -0, 0.3$; $X^* = -0.5$.