

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)  $X_i = 0.1p, 0.2p, 0.3p, 0.4p$ ; б)  $X_i = 0.1p, \frac{p}{6}, 0.3p, 0.4p$ ;  $X^* = \frac{p}{4}$ .
2.  $y = \cos(x)$ , а)  $X_i = 0, \frac{p}{6}, \frac{2p}{6}, \frac{3p}{6}$ ; б)  $X_i = 0, \frac{p}{6}, \frac{5p}{12}, \frac{p}{2}$ ;  $X^* = \frac{p}{4}$ .
3.  $y = \tan(x)$ , а)  $X_i = 0, \frac{p}{8}, \frac{2p}{8}, \frac{3p}{8}$ ; б)  $X_i = 0, \frac{p}{8}, \frac{p}{3}, \frac{3p}{8}$ ;  $X^* = \frac{3p}{16}$ .
4.  $y = \cot(x)$ , а)  $X_i = \frac{p}{8}, \frac{2p}{8}, \frac{3p}{8}, \frac{4p}{8}$ ; б)  $X_i = \frac{p}{8}, \frac{5p}{16}, \frac{3p}{8}, \frac{p}{2}$ ;  $X^* = \frac{p}{3}$ .
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.  $y = \arctan(x)$ , 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)  $X_i = 0, \frac{p}{6}, \frac{2p}{6}, \frac{3p}{6}$ ; б)  $X_i = 0, \frac{p}{6}, \frac{p}{4}, \frac{p}{2}$ ;  $X^* = 1.0$ .
13.  $y = \cos(x) + x$ , а)  $X_i = 0, \frac{p}{6}, \frac{2p}{6}, \frac{3p}{6}$ ; б)  $X_i = 0, \frac{p}{6}, \frac{p}{4}, \frac{p}{2}$ ;  $X^* = 1.0$ .
14.  $y = \tan(x) + x$ , а)  $X_i = 0, \frac{p}{8}, \frac{2p}{8}, \frac{3p}{8}$ ; б)  $X_i = 0, \frac{p}{8}, \frac{p}{3}, \frac{3p}{8}$ ;  $X^* = \frac{3p}{16}$ .
15.  $y = \cot(x) + x$ , а)  $X_i = \frac{p}{8}, \frac{2p}{8}, \frac{3p}{8}, \frac{4p}{8}$ ; б)  $X_i = \frac{p}{8}, \frac{p}{3}, \frac{3p}{8}, \frac{p}{2}$ ;  $X^* = \frac{3p}{16}$ .
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.  $y = \arctg(x) + x$ , a)  $X_i = -3, -1, 1, 3$ ; 6)  $X_i = -3, 0, 1, 3$ ;  $X^* = -0.5$ .
22.  $y = \operatorname{arcctg}(x) + x$ , a)  $X_i = -3, -1, 1, 3$ ; 6)  $X_i = -3, 0, 1, 3$ ;  $X^* = -0.5$ .
23.  $y = \frac{1}{x}$ , a)  $X_i = 0.1, 0.5, 0.9, 1.3$ ; 6)  $X_i = 0.1, 0.5, 1.1, 1.3$ ;  $X^* = 0.8$ .
24.  $y = \frac{1}{x^2}$ , a)  $X_i = 0.1, 0.5, 0.9, 1.3$ ; 6)  $X_i = 0.1, 0.5, 1.1, 1.3$ ;  $X^* = 0.8$ .
25.  $y = \frac{1}{x} + x$ , a)  $X_i = 0.1, 0.5, 0.9, 1.3$ ; 6)  $X_i = 0.1, 0.5, 1.1, 1.3$ ;  $X^* = 0.8$ .
26.  $y = \frac{1}{x^2} + x^2$ , a)  $X_i = 0.1, 0.5, 0.9, 1.3$ ; 6)  $X_i = 0.1, 0.5, 1.1, 1.3$ ;  $X^* = 0.8$ .
27.  $y = x \sin(x)$ , a)  $X_i = 0, \frac{\pi}{6}, \frac{2\pi}{6}, \frac{3\pi}{6}$ ; 6)  $X_i = 0, \frac{\pi}{6}, \frac{5\pi}{12}, \frac{\pi}{2}$ ;  $X^* = \frac{\pi}{4}$ .
28.  $y = x \cos(x)$ , a)  $X_i = 0, \frac{\pi}{6}, \frac{2\pi}{6}, \frac{3\pi}{6}$ ; 6)  $X_i = 0, \frac{\pi}{6}, \frac{5\pi}{12}, \frac{\pi}{2}$ ;  $X^* = \frac{\pi}{4}$ .
29.  $y = xe^x$ , a)  $X_i = -2, -1, 0, 1$ ; 6)  $X_i = -2, -1, 0.2, 1$ ;  $X^* = -0.5$ .
30.  $y = x^2 e^x$ , a)  $X_i = -1.2, -0.7, -0.2, 0.3$ ; 6)  $X_i = -1.2, -0.7, -0, 0.3$ ;  $X^* = -0.5$ .