

Решение систем нелинейных уравнений

Решить систему нелинейных уравнений с точностью $\varepsilon = 0.03$ и начальным

приближением $\vec{x}^{(0)} = \begin{bmatrix} 0.5 \\ 0.5 \end{bmatrix}$

$$\begin{cases} 2 \cdot x_1 - x_2^2 - 1 = 0 \\ 3 \cdot x_1^2 - x_2 - 2 = 0 \end{cases} \quad \mathbf{J} = \begin{bmatrix} 2 & -2 \cdot x_2 \\ 6 \cdot x_1 & -1 \end{bmatrix}$$

i	$\vec{x}^{(i-1)}$	$\vec{f}(\vec{x}^{(i-1)})$	\mathbf{J}		\mathbf{J}^{-1}		$\vec{\Delta x}$	$\vec{x}^{(i)}$	$\ \vec{\Delta x}\ $
1	0.500	-0.250	2.000	-1.000	-1.000	1.000	-1.500	2.000	3.132
	0.500	-1.750	3.000	-1.000	-3.000	2.000	-2.750	3.250	
2	2.000	-7.562	2.000	-6.500	-0.013	0.086	0.677	1.323	1.530
	3.250	6.750	12.000	-1.000	-0.158	0.026	1.372	1.878	
3	1.323	-1.882	2.000	-3.757	-0.036	0.135	0.253	1.070	0.684
	1.878	1.374	7.939	-1.000	-0.285	0.072	0.636	1.243	
4	1.070	-0.404	2.000	-2.485	-0.072	0.178	0.063	1.007	0.223
	1.243	0.192	6.420	-1.000	-0.460	0.143	0.213	1.029	
5	1.007	-0.046	2.000	-2.058	-0.096	0.197	0.007	1.000	0.029
	1.029	0.012	6.041	-1.000	-0.579	0.192	0.029	1.001	

Ответ: $\vec{x} = \begin{bmatrix} 1.000 \\ 1.001 \end{bmatrix}$

Задания.

Определить корни с точностью $\varepsilon = 0.03$

1.
$$\begin{cases} \sin(x_1 + 1.5) - x_2 = 1.2 \\ \sqrt{0.16 - x_1^2} + x_2 = 0 \end{cases} \quad \vec{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

4.
$$\begin{cases} \sin(x_1 + 1.5) - x_2 = 1.2 \\ 2^{x_1} - x_2 - 1.5 = 0 \end{cases} \quad \vec{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

2.
$$\begin{cases} \sin(x_1 + 1.5) - x_2 = 1.2 \\ \cos(x_1) + x_2 - 0.5 = 0 \end{cases} \quad \vec{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

5.
$$\begin{cases} \sin(x_1 + 1.5) - x_2 = 1.2 \\ (1.2 \cdot x_1)^3 - x_2 - 1 = 0 \end{cases} \quad \vec{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

3.
$$\begin{cases} \sin(x_1 + 1.5) - x_2 = 1.2 \\ \frac{1}{x_1 + 1.5} - x_2 - 1 = 0 \end{cases} \quad \vec{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

6.
$$\begin{cases} \sin(x_1 + 1.5) - x_2 = 1.2 \\ 1.2 \cdot e^{x_1} - x_2 - 1.5 = 0 \end{cases} \quad \vec{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$7. \begin{cases} \sin(x_1 + 1.5) - x_2 = 1.2 \\ \ln(x_1 + 1.5) + x_2 - 0.2 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$8. \begin{cases} \sin(x_1 + 1.5) - x_2 = 1.2 \\ (x_1 + 1.5)^{\frac{1}{3}} - x_2 - 1.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$9. \begin{cases} \sqrt{0.16 - \left(\frac{x}{3}\right)^2} + x_2 = 0 \\ \cos(x_1) + x_2 - 0.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$10. \begin{cases} \sqrt{0.16 - x_1^2} + x_2 = 0 \\ \frac{1}{x_1 + 1.5} - x_2 - 1 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$11. \begin{cases} \sqrt{0.16 - x_1^2} + x_2 = 0 \\ 2^{x_1} - x_2 - 1.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$12. \begin{cases} \sqrt{0.16 - \left(\frac{x}{3}\right)^2} + x_2 = 0 \\ (1.2 \cdot x_1)^3 - x_2 - 1 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$13. \begin{cases} \sqrt{0.16 - x_1^2} + x_2 = 0 \\ 1.2 \cdot e^{x_1} - x_2 - 1.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} -0.3 \\ -0.3 \end{bmatrix}$$

$$14. \begin{cases} \sqrt{0.16 - x_1^2} + x_2 = 0 \\ \ln(x_1 + 1.5) + x_2 - 0.2 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$15. \begin{cases} \sqrt{0.16 - x_1^2} + x_2 = 0 \\ (x_1 + 1.5)^{\frac{1}{3}} - x_2 - 1.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$16. \begin{cases} \cos(x_1) + x_2 - 0.5 = 0 \\ \frac{1}{x_1 + 1.5} - x_2 - 1 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$17. \begin{cases} \cos(x_1) + x_2 - 0.5 = 0 \\ 2^{x_1} - x_2 - 1.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$18. \begin{cases} \cos(x_1) + x_2 - 0.5 = 0 \\ (1.2 \cdot x_1)^3 - x_2 - 1 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$19. \begin{cases} \cos(x_1) + x_2 - 0.5 = 0 \\ 1.2 \cdot e^{x_1} - x_2 - 1.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$20. \begin{cases} \cos(x_1) + x_2 - 0.5 = 0 \\ \ln(x_1 + 1.5) + x_2 - 0.2 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$21. \begin{cases} \cos(x_1) + x_2 - 0.5 = 0 \\ (x_1 + 1.5)^{\frac{1}{3}} - x_2 - 1.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$22. \begin{cases} \frac{1}{x_1 + 1.5} - x_2 - 1 = 0 \\ 2^{x_1} - x_2 - 1.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$23. \begin{cases} \frac{1}{x_1 + 1.5} - x_2 - 1 = 0 \\ (1.2 \cdot x_1)^3 - x_2 - 1 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$24. \begin{cases} \frac{1}{x_1 + 1.5} - x_2 - 1 = 0 \\ 1.2 \cdot e^{x_1} - x_2 - 1.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$25. \begin{cases} \frac{1}{x_1 + 1.5} - x_2 - 1 = 0 \\ \ln(x_1 + 1.5) + x_2 - 0.2 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$26. \begin{cases} \frac{1}{x_1 + 1.5} - x_2 - 1 = 0 \\ (x_1 + 1.5)^{\frac{1}{3}} - x_2 - 1.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$27. \begin{cases} 2^{x_1} - x_2 - 1.5 = 0 \\ (1.2 \cdot x_1)^3 - x_2 - 1 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$28. \begin{cases} 2^{x_1} - x_2 - 1.5 = 0 \\ 1.2 \cdot e^{x_1} - x_2 - 1.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$29. \begin{cases} 2^{x_1} - x_2 - 1.5 = 0 \\ \ln(x_1 + 1.5) + x_2 - 0.2 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$30. \begin{cases} 2^{x_1} - x_2 - 1.5 = 0 \\ (x_1 + 1.5)^{\frac{1}{3}} - x_2 - 1.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$31. \begin{cases} (1.2 \cdot x_1)^3 - x_2 - 0.1 = 0 \\ 1.2 \cdot e^{x_1} - x_2 - 1.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$32. \begin{cases} (1.2 \cdot x_1)^3 - x_2 - 1 = 0 \\ \ln(x_1 + 1.5) + x_2 - 0.2 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$33. \begin{cases} (1.2 \cdot x_1)^3 - x_2 - 1 = 0 \\ (x_1 + 1.5)^{\frac{1}{3}} - x_2 - 1.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$34. \begin{cases} 1.2 \cdot e^{x_1} - x_2 - 1.5 = 0 \\ \ln(x_1 + 1.5) + x_2 - 0.2 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$35. \begin{cases} 1.2 \cdot e^{x_1} - x_2 - 1.5 = 0 \\ (x_1 + 1.5)^{\frac{1}{3}} - x_2 - 1.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$

$$36. \begin{cases} \ln(x_1 + 1.5) + x_2 - 0.2 = 0 \\ (x_1 + 1.5)^{\frac{1}{3}} - x_2 - 1.5 = 0 \end{cases} \quad \bar{x}^0 = \begin{bmatrix} 0.3 \\ 0.3 \end{bmatrix}$$