수치해석 7주차 과제

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$$3x_1 - 0.1x_2 - 0.2x_3 = 7.85 \quad \cdots ①$$
$$0.1x_1 + 7x_2 - 0.3x_3 = -19.3 \quad \cdots ②$$
$$0.3x_1 - 0.2x_2 + 10x_3 = 71.4 \quad \cdots ③$$

1) 첫 번째 식에 $\frac{0.1}{3}$을 곱하면 $\left(① \times \frac{a_{21}}{a_{11}}\right)$

$$\Rightarrow 0.1x_1 - \frac{0.01}{3}x_2 - \frac{0.02}{3}x_3 = \frac{0.1}{3} \times 7.85$$

2) 두 번째 식에서 1)을 뺀다 $\left(② = ② - ① \times \frac{a_{21}}{a_{11}}\right)$

$$②' \Rightarrow +\left(7 + \frac{0.01}{3}\right)x_2 + \left(-0.3 + \frac{0.02}{3}\right)x_3 = -19.3 - \frac{0.1}{3} \times 7.85$$

$$\Rightarrow \boxed{\frac{2101}{300}x_2 - \frac{22}{75}x_3 = -\frac{11737}{600}}$$

3) 첫 번째 식에 $\frac{0.3}{3}$을 곱하면 $\left(① \times \frac{a_{31}}{a_{11}}\right)$

$$\Rightarrow 0.3x_1 - 0.01x_2 - 0.02x_3 = 0.785$$

4) 세 번째 식에서 3)을 뺀다 $\left(③ = ③ - ① \times \frac{a_{31}}{a_{11}}\right)$

$$③' \Rightarrow \boxed{-0.19x_2 + 10.02x_3 = 70.615}$$

5) ②'에 $\left(-0.19 \div \frac{2101}{300}\right)$를 곱하면 $\left(②' \times \frac{a_{32}'}{a_{22}'}\right)$

$$\Rightarrow -0.19x_2 + \frac{38}{4775}x_3 = \frac{20273}{38200}$$

6) ③'에서 5)를 뺀다 $\left(③'' = ③' - ②' \times \frac{a_{32}'}{a_{22}'}\right)$

$$③'' \Rightarrow \boxed{\frac{19123}{1910}x_3 = \frac{133861}{1910}}$$

$\therefore$
$$① \Rightarrow 3x_1 - 0.1x_2 - 0.2x_3 = 7.85$$
$$②' \Rightarrow \frac{2101}{300}x_2 - \frac{22}{75}x_3 = -\frac{11737}{600}$$
$$③'' \Rightarrow \frac{19123}{1910}x_3 = \frac{133861}{1910}$$

7) 후진 대입

③''에서 $x_3 = 7$

②'에서 $x_2 = \left(-\frac{11737}{600} + \frac{22}{75} \times 7\right) \times \frac{300}{2101} = -2.5$

①에서 $x_1 = (7.85 + 0.1 \times (-2.5) + 0.2 \times 7) \div 3 = 3$

$\therefore$
$$x_1 = 3$$
$$x_2 = -2.5$$
$$x_3 = 7$$