

ORIGIN := 1

T := 444

$$T_c := \begin{pmatrix} 304.2 \\ 425 \end{pmatrix}$$

$$P_c := \begin{pmatrix} 73.8 \\ 38 \end{pmatrix}$$

$$k := \begin{pmatrix} 0 & 0.18 \\ 0.18 & 0 \end{pmatrix}$$

$$y := \begin{pmatrix} 0.15 \\ 0.85 \end{pmatrix}$$

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root(p, q, r) :=  $\left| \begin{array}{l} v \leftarrow \begin{pmatrix} r \\ q \\ p \\ 1 \end{pmatrix} \\ x \leftarrow \text{polyroots}(v) \\ \text{for } i \in 1..3 \\ \quad x_i \leftarrow 0 \text{ if } \text{Im}(x_i) \neq 0 \\ x1 \leftarrow \max(x) \\ y \leftarrow \min(x) \\ x2 \leftarrow \begin{cases} \max(x) & \text{if } y = 0 \\ y & \text{otherwise} \end{cases} \\ \begin{pmatrix} x1 \\ x2 \end{pmatrix} \end{array} \right.$ 
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$$\begin{aligned}
\phi(P) := & \text{for } i \in 1..2 \\
& \left| \begin{array}{l}
T_{r_i} \leftarrow \frac{T}{T_{c_i}} \\
P_{r_i} \leftarrow \frac{P}{P_{c_i}} \\
A_{i,i} \leftarrow 0.42748 \left[\frac{P_{r_i}}{(T_{r_i})^{2.5}} \right] \\
B_i \leftarrow 0.08664 \cdot \frac{P_{r_i}}{T_{r_i}}
\end{array} \right. \\
& \text{for } i \in 1..2 \\
& \quad \text{for } j \in 1..2 \\
& \quad \quad A_{i,j} \leftarrow (1 - k_{i,j}) \cdot \sqrt{A_{i,i} \cdot A_{j,j}} \\
& \quad A_{\text{mix}} \leftarrow \sum_{i=1}^2 \sum_{j=1}^2 (y_i \cdot y_j \cdot A_{i,j}) \\
& \quad B_{\text{mix}} \leftarrow \sum_{i=1}^2 (y_i \cdot B_i) \\
& \quad p \leftarrow -1 \\
& \quad q \leftarrow A_{\text{mix}} - B_{\text{mix}} - B_{\text{mix}}^2 \\
& \quad r \leftarrow -A_{\text{mix}} \cdot B_{\text{mix}} \\
& \quad Z \leftarrow \text{root}(p, q, r)_1 \\
& \quad C \leftarrow \ln \left(1 + \frac{B_{\text{mix}}}{Z} \right) \\
& \quad \text{for } i \in 1..2 \\
& \quad \quad \left[\begin{array}{l}
\phi_i \leftarrow \exp \left[\frac{B_i \cdot (Z - 1)}{B_{\text{mix}}} - \ln(Z - B_{\text{mix}}) - \frac{A_{\text{mix}} \cdot C}{B_{\text{mix}}} \cdot \left[\frac{2 \cdot \sum_{j=1}^2 (y_j \cdot A_{i,j})}{A_{\text{mix}}} - \frac{B_i}{B_{\text{mix}}} \right] \right]
\end{array} \right] \\
& \phi_1
\end{aligned}$$

| | |
|--------|-----|
| $P :=$ | 1 |
| | 10 |
| | 50 |
| | 60 |
| | 70 |
| | 80 |
| | 90 |
| | 100 |
| | 150 |
| | 200 |
| | 250 |
| | 300 |

| | |
|-------------|-------------|
| $\phi_1 :=$ | $\phi(1)$ |
| | $\phi(10)$ |
| | $\phi(50)$ |
| | $\phi(60)$ |
| | $\phi(70)$ |
| | $\phi(80)$ |
| | $\phi(90)$ |
| | $\phi(100)$ |
| | $\phi(150)$ |
| | $\phi(200)$ |
| | $\phi(250)$ |
| | $\phi(300)$ |

| | |
|----|-------|
| | 1 |
| 1 | 1.002 |
| 2 | 1.021 |
| 3 | 1.25 |
| 4 | 1.392 |
| 5 | 1.498 |
| 6 | 1.519 |
| 7 | 1.498 |
| 8 | 1.462 |
| 9 | 1.277 |
| 10 | 1.151 |
| 11 | 1.069 |
| 12 | 1.015 |

