EXAMPLE 3.20

ORIGIN := 1

$T_c := 282.5$ $P_c := 50.6$ $\omega := 0.089$ $R := 8.314$

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root(p, q, r) :=  | v ← (r, q, p, 1)^T
                  | x ← polyroots(v)
                  | for  i ∈ 1 .. 3
                  |    x_i ← 0  if  Im(x_i) ≠ 0
                  | x1 ← max(x)
                  | y ← min(x)
                  | x2 ← | max(x)  if  y = 0
                  |      | y  otherwise
                  | (x1, x2)^T
```

$$\mathrm{Dep}(T,P) := \begin{array}{|l} T_r \leftarrow \dfrac{T}{T_c} \\ P_r \leftarrow \dfrac{P}{P_c} \\ \alpha \leftarrow \left[1 + \left(0.37464 + 1.54226\omega - 0.26992\omega^2\right)\cdot\left(1 - \sqrt{T_r}\right)\right]^2 \\ A \leftarrow 0.45724\cdot\dfrac{P_r\cdot\alpha}{{T_r}^2} \\ B \leftarrow 0.07780\cdot\dfrac{P_r}{T_r} \\ p \leftarrow -1 + B \\ q \leftarrow A - 2B - 3B^2 \\ r \leftarrow -A\cdot B + B^2 + B^3 \\ Z \leftarrow \mathrm{root}(p, q, r)_1 \\ \Gamma \leftarrow \left(0.37464 + 1.54226\omega - 0.26992\omega^2\right)\cdot\sqrt{\dfrac{T_r}{\alpha}} \\ U \leftarrow -R\cdot T\cdot\left[\dfrac{A\cdot(1+\Gamma)}{\sqrt{8}B}\cdot\ln\left[\dfrac{Z + \left(1+\sqrt{2}\right)\cdot B}{Z + \left(1-\sqrt{2}\right)\cdot B}\right]\right] \\ S \leftarrow R\cdot\left[\ln(Z - B) - \dfrac{A\cdot\Gamma}{\sqrt{8}B}\cdot\ln\left[\dfrac{Z + \left(1+\sqrt{2}\right)\cdot B}{Z + \left(1-\sqrt{2}\right)\cdot B}\right]\right] \\ \begin{pmatrix} U \\ S \end{pmatrix} \end{array}$$

$U(T,P) := \mathrm{Dep}(T,P)_1$ $\qquad$ $S(T,P) := \mathrm{Dep}(T,P)_2$

This is Eq. (3.6-5)

$$\Delta U := -U(393, 35) + U(393, 205) = -3.845\times 10^3$$

This is Eq. (3.6-4)

$$\Delta S := -S(393, 35) - R\cdot\ln\left(\frac{205}{35}\right) + S(393, 205) = -22.988$$

$$W := 0.118\left[\Delta U - (393)\cdot\Delta S\right] = 612.35$$