

Isothermes d'Andrews

$$p := \frac{8 T}{3 V - 1} - \frac{3}{V^2}$$

$$\frac{8 T}{3 V - 1} - \frac{3}{V^2} \quad (1)$$

$$dp := \frac{d}{d V} p$$

$$-\frac{24 T}{(3 V - 1)^2} + \frac{6}{V^3} \quad (2)$$

$$ddp := \frac{d}{d V} dp$$

$$\frac{144 T}{(3 V - 1)^3} - \frac{18}{V^4} \quad (3)$$

$$pps := \text{Array}(1 \dots 250, \text{datatype} = \text{float}_8)$$

$$\left[\begin{array}{l} 1 \dots 250 \text{ Array} \\ \text{Data Type: float}_8 \\ \text{Storage: rectangular} \\ \text{Order: Fortran_order} \end{array} \right] \quad (4)$$

$$VV1 := \text{Array}(1 \dots 250, \text{datatype} = \text{float}_8)$$

$$\left[\begin{array}{l} 1 \dots 250 \text{ Array} \\ \text{Data Type: float}_8 \\ \text{Storage: rectangular} \\ \text{Order: Fortran_order} \end{array} \right] \quad (5)$$

$$VV2 := \text{Array}(1 \dots 250, \text{datatype} = \text{float}_8)$$

$$\left[\begin{array}{l} 1 \dots 250 \text{ Array} \\ \text{Data Type: float}_8 \\ \text{Storage: rectangular} \\ \text{Order: Fortran_order} \end{array} \right] \quad (6)$$

$$Ts := 1$$

$$1 \quad (7)$$

$$pps[1] := 1$$

$$1 \quad (8)$$

$$VV1[1] := 1$$

$$1 \quad (9)$$

$$VV2[1] := 1$$

$$1 \quad (10)$$

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for jj from 1 to 249 do
  Ts := Ts - 0.0020;
  V0 := fsolve(subs(T=Ts, ddp)); # point d'inflexion
  p0 := subs(T=Ts, V=V0, p);
  Vtemp := solve( {subs(T=Ts, dp), V > 0.34 }, allsolutions);
  Vmn := min(rhs(Vtemp[1][1]), rhs(Vtemp[2][1])); # minimum relatif
  Vmx := max(rhs(Vtemp[1][1]), rhs(Vtemp[2][1])); # maximum relatif
  ps := subs(T=Ts, V=Vmx, p) - 0.0005; # premiere estimation
  V1 := fsolve(subs(T=Ts, p) = ps, V=0.34 .. Vmn);
  V2 := fsolve(subs(T=Ts, p) = ps, V=Vmx ..1000);
  II :=  $\int_{V1}^{V2} (\textit{subs}(T=T_s, p) - ps) \, dV$ ;

  for ii from 1 to 990 while II < 0 do
    ps := ps - 0.001 ;
    V1 := fsolve(subs(T=Ts, p) = ps, V=0.34 ..Vmn);
    V2 := fsolve(subs(T=Ts, p) = ps, V=Vmx ..1000);
    II :=  $\int_{V1}^{V2} (\textit{subs}(T=T_s, p) - ps) \, dV$ ;

  end do:
  pps[1 + jj] := ps;
  VV1[1 + jj] := V1;
  VV2[1 + jj] := V2;
end do:

p120 := plot(subs(T=1.2, p), V=0.4 ..2) :
p110 := plot(subs(T=1.1, p), V=0.4 ..2) :
p100 := plot(subs(T=1.0, p), V=0.4 ..2) :
p95 := plot(subs(T=0.95, p), V=0.4 ..2) :
p90 := plot(subs(T=0.9, p), V=0.4 ..2) :
p85 := plot(subs(T=0.85, p), V=0.4 ..2) :
pV1 := plot(VV1, pps, color=black) :
pV2 := plot(VV2, pps, color=black) :
plots[display]( {p120, p110, p100, p95, p90, p85, pV1, pV2}, coordinateview = [0 ..2, 0 ..2], labels
  = [V, 'p']
)

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