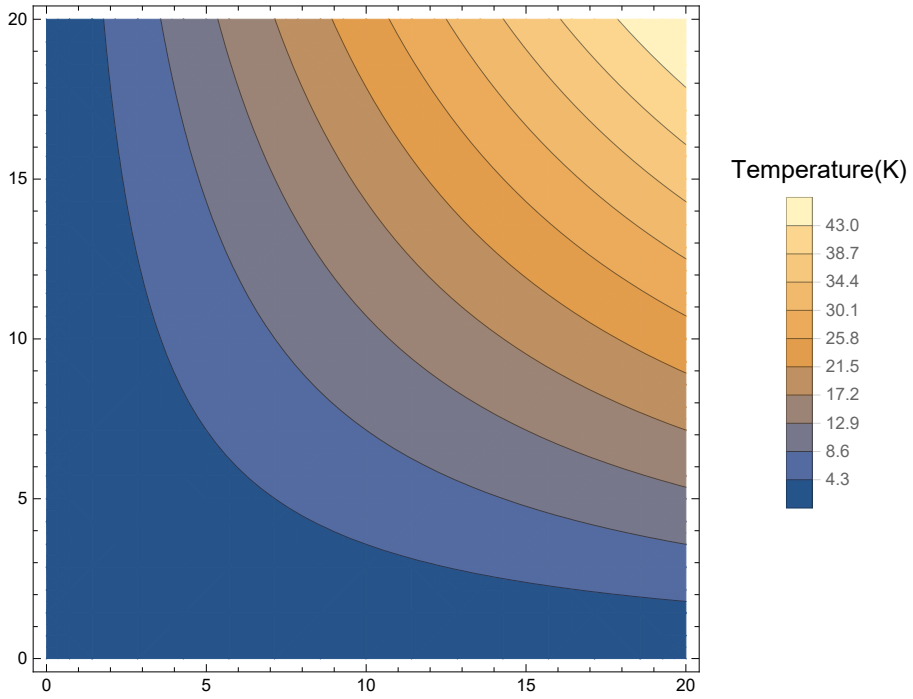
- $(p + a/v^2)(v - b) = RT$ - Van der waals gas

In[3]:=
```
R = 8.31;
T[p_, v_, a_, b_] := (p + a / v^2) (v - b) / R;
TT[p_, v_] := 8 (p + 3 / v^2) (v - 1 / 3) / 3
```

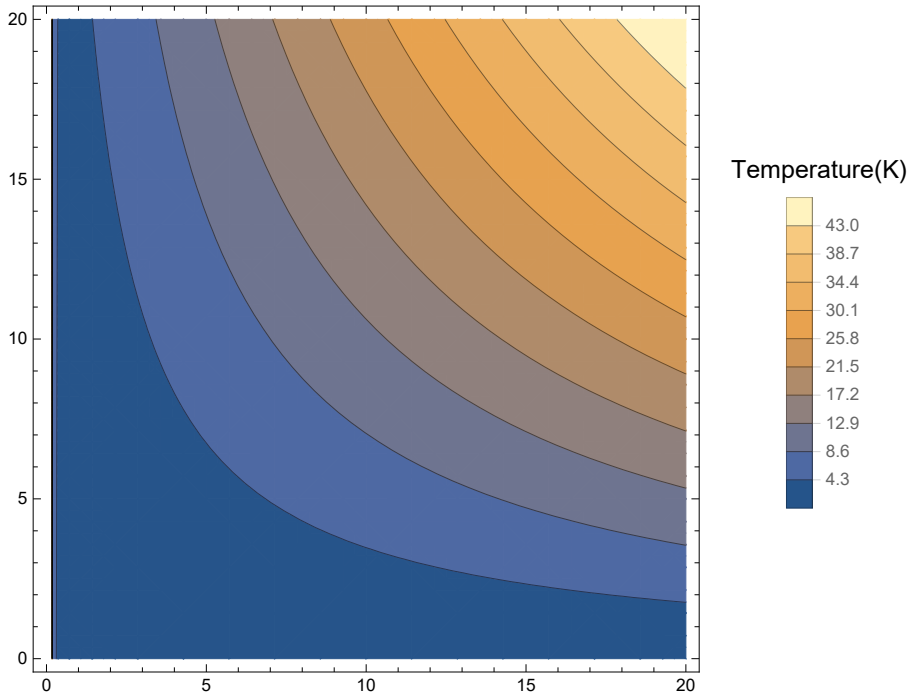
- Ideal gas (x axis->v, y axis ->p)

```
ContourPlot[T[p, v, 0, 0], {v, 0, 20}, {p, 0, 20}, Contours → 10,
 PlotLegends → BarLegend[Automatic, LegendMarkerSize → 180,
   LegendFunction → "Frame", LegendMargins → 5, LegendLabel → "Temperature(K)"]]
```

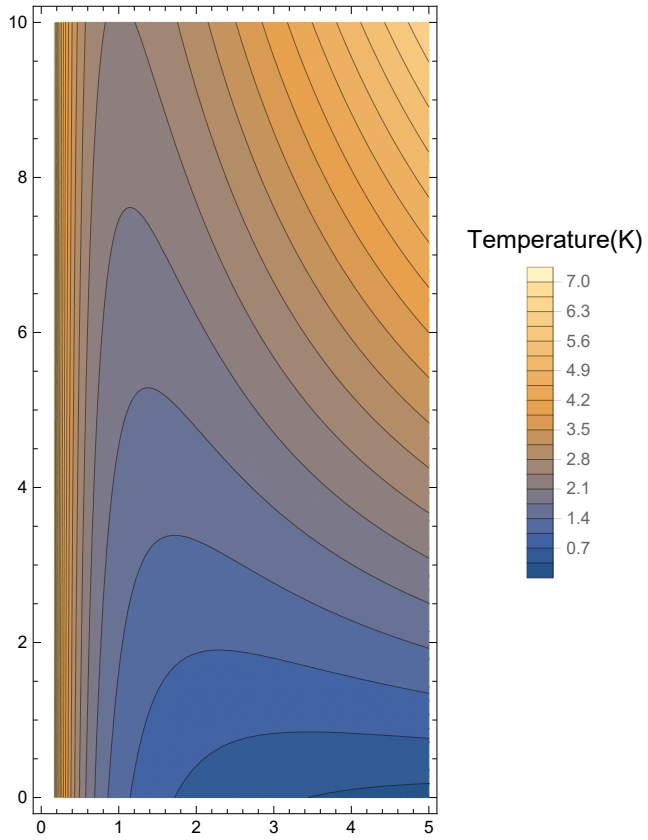


- high molecular interaction & low repulsive force

```
ContourPlot[T[p, v, 10, 0], {v, 0, 20}, {p, 0, 20}, Contours → 10,
 PlotLegends → BarLegend[Automatic, LegendMarkerSize → 180,
   LegendFunction → "Frame", LegendMargins → 5, LegendLabel → "Temperature(K)"]]
```

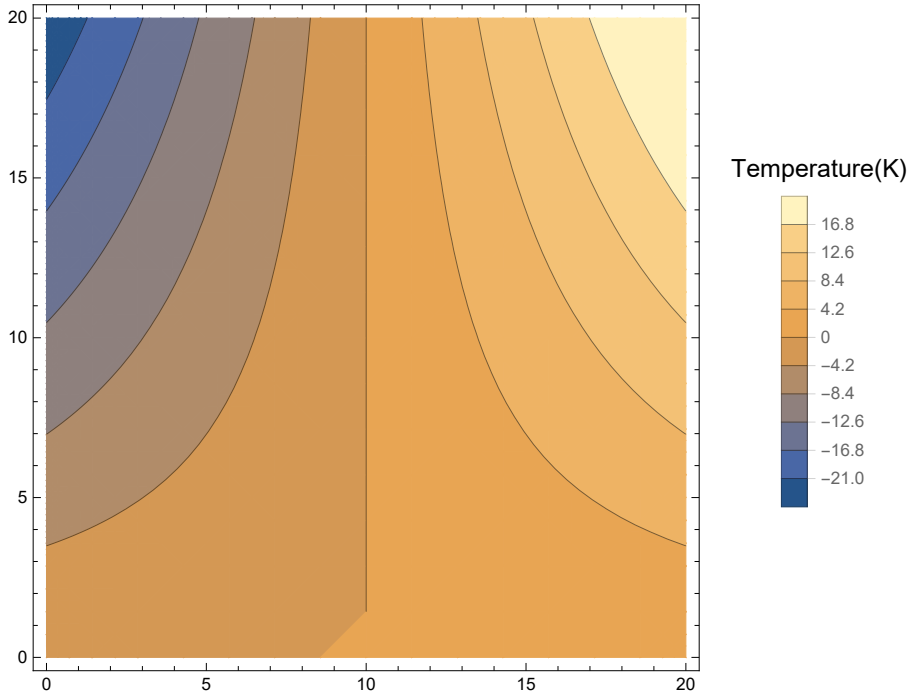



```
ContourPlot[T[p, v, 10, 0], {v, 0, 5}, {p, 0, 10}, Contours → 20,
 AspectRatio → Automatic, PlotLegends → BarLegend[Automatic, LegendMarkerSize → 180,
   LegendFunction → "Frame", LegendMargins → 5, LegendLabel → "Temperature(K)"]]
```



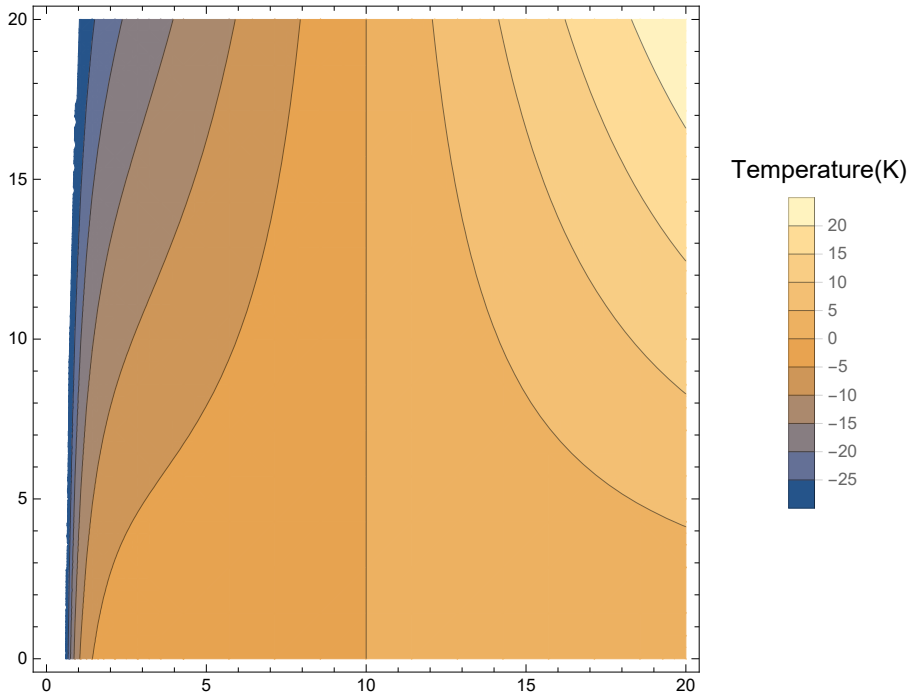
■ low interaction & high repulsive force

```
ContourPlot[T[p, v, 0, 10], {v, 0, 20}, {p, 0, 20}, Contours → 10,
 PlotLegends → BarLegend[Automatic, LegendMarkerSize → 180,
   LegendFunction → "Frame", LegendMargins → 5, LegendLabel → "Temperature(K)"]]
```



■ High interaction & high repulsive force

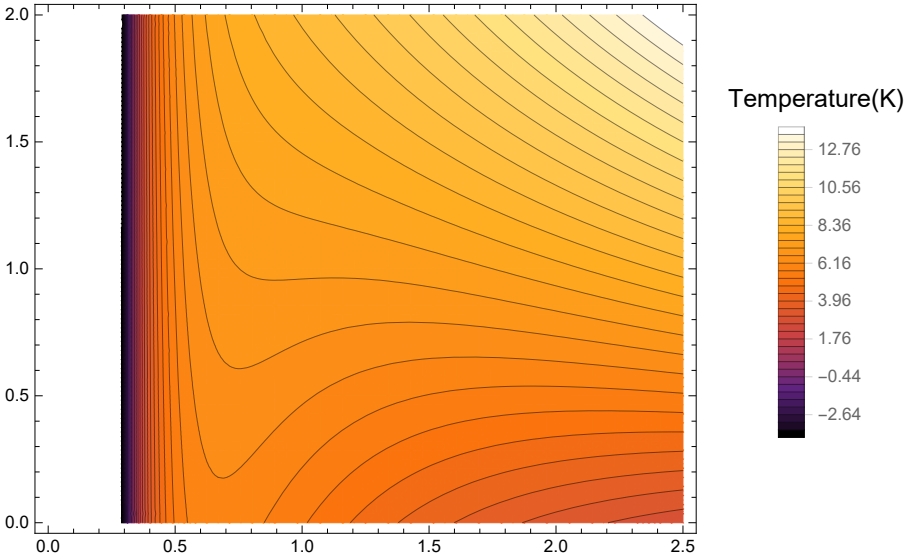
```
ContourPlot[T[p, v, 10, 10], {v, 0, 20}, {p, 0, 20}, Contours → 10,
 PlotLegends → BarLegend[Automatic, LegendMarkerSize → 180,
   LegendFunction → "Frame", LegendMargins → 5, LegendLabel → "Temperature(K)"]]
```



■ ETC..

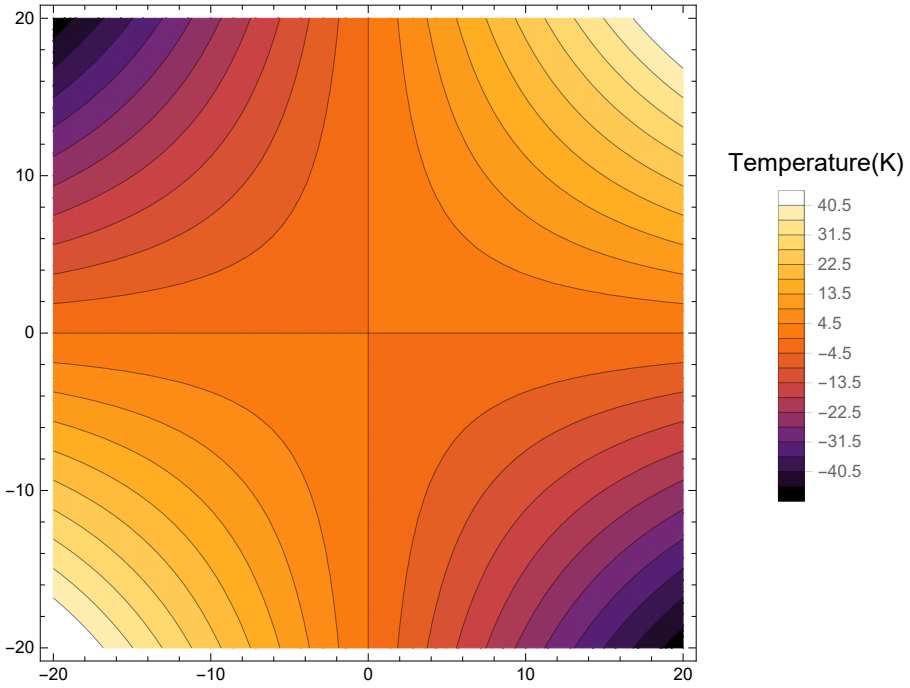
In[18]:=
```
ContourPlot[TT[p, v], {v, 0, 2.5}, {p, 0, 2}, Contours → 40,
 ColorFunction → ColorData["SunsetColors"], AspectRatio → Automatic,
 PlotLegends → BarLegend[Automatic, LegendMarkerSize → 180,
   LegendFunction → "Frame", LegendMargins → 5, LegendLabel → "Temperature(K)"]]
```

Out[18]=

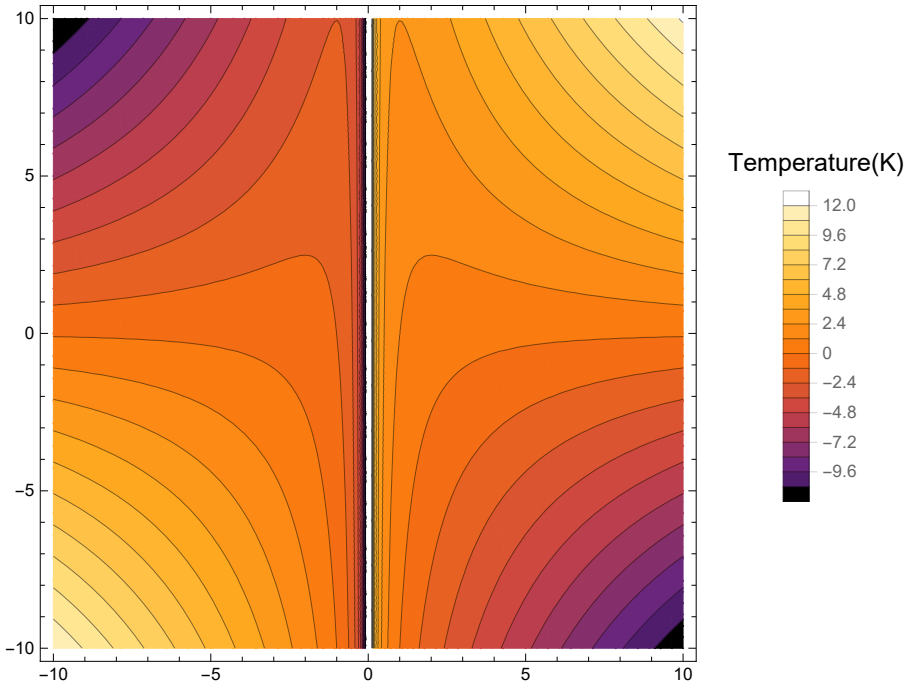


Reif fig. 8.6.1

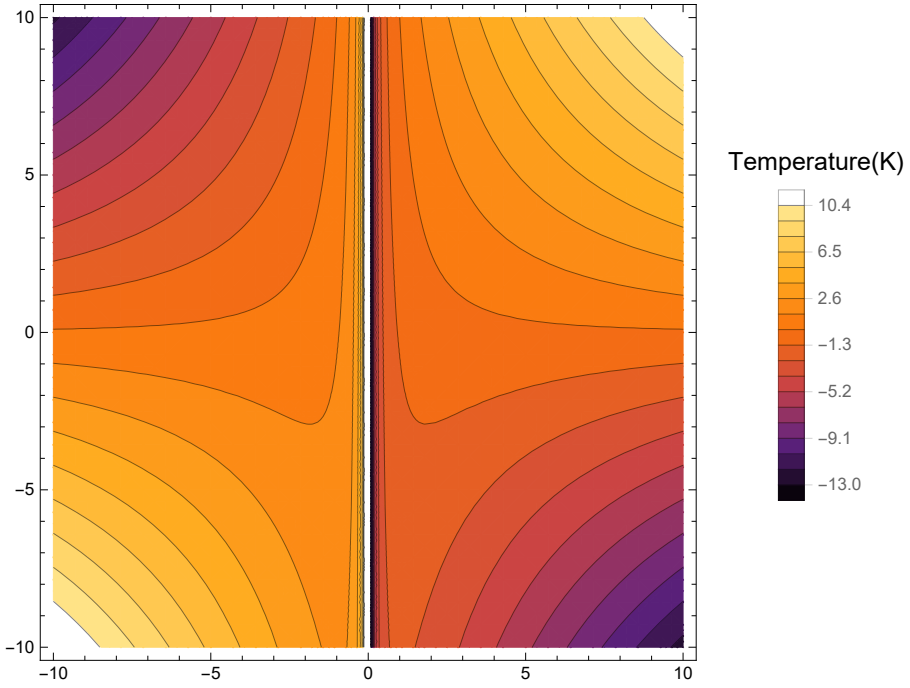
```
ContourPlot[T[p, v, 0, 0], {v, -20, 20}, {p, -20, 20},
 Contours → 20, ColorFunction → ColorData["SunsetColors"],
 PlotLegends → BarLegend[Automatic, LegendMarkerSize → 180,
   LegendFunction → "Frame", LegendMargins → 5, LegendLabel → "Temperature(K)"]]
```



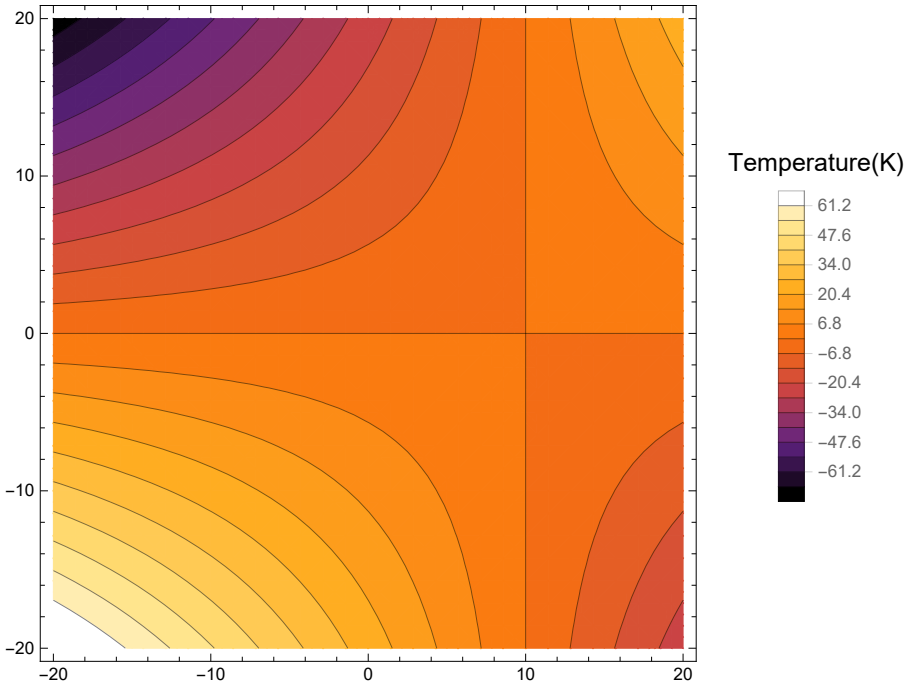
```
ContourPlot[T[p, v, 10, 0], {v, -10, 10}, {p, -10, 10},
 Contours → 20, ColorFunction → ColorData["SunsetColors"],
 PlotLegends → BarLegend[Automatic, LegendMarkerSize → 180,
   LegendFunction → "Frame", LegendMargins → 5, LegendLabel → "Temperature(K)"]]
```



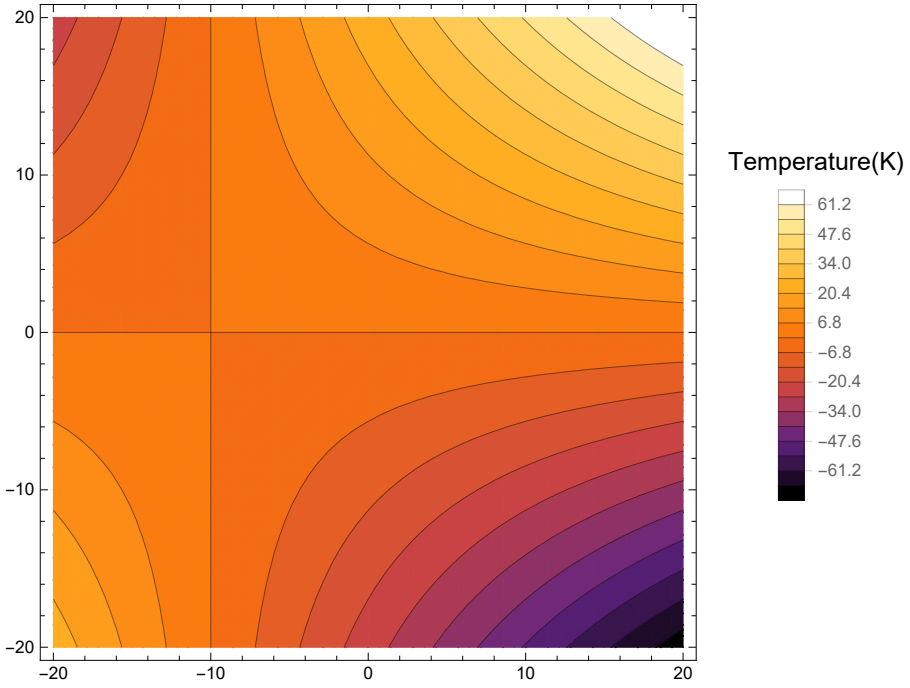

```
ContourPlot[T[p, v, -10, 0], {v, -10, 10}, {p, -10, 10},
 Contours → 20, ColorFunction → ColorData["SunsetColors"],
 PlotLegends → BarLegend[Automatic, LegendMarkerSize → 180,
   LegendFunction → "Frame", LegendMargins → 5, LegendLabel → "Temperature(K)"]]
```



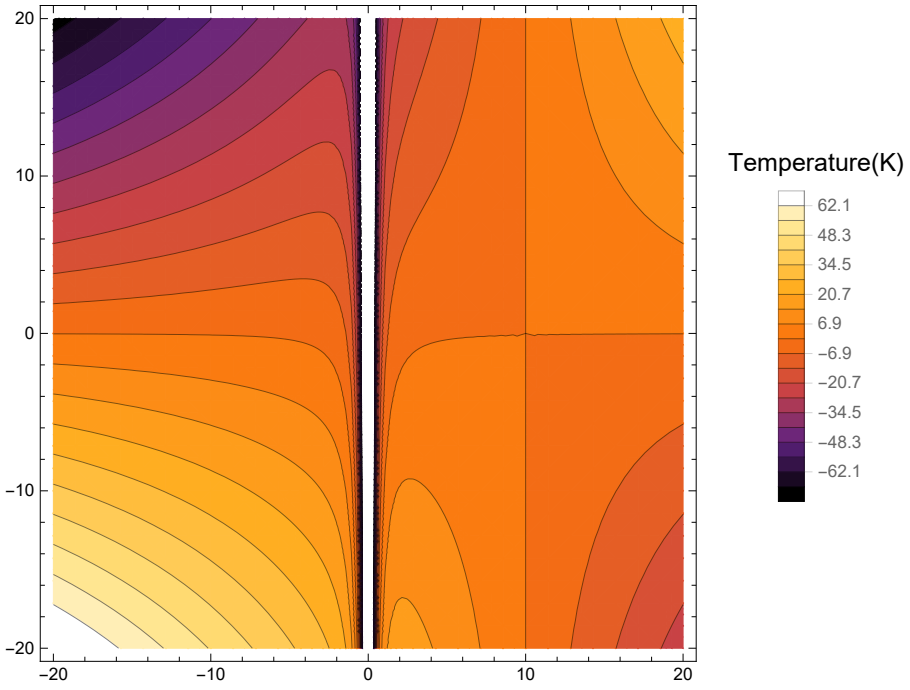
```
ContourPlot[T[p, v, 0, 10], {v, -20, 20}, {p, -20, 20},
 Contours → 20, ColorFunction → ColorData["SunsetColors"],
 PlotLegends → BarLegend[Automatic, LegendMarkerSize → 180,
   LegendFunction → "Frame", LegendMargins → 5, LegendLabel → "Temperature(K)"]]
```




```
ContourPlot[T[p, v, 0, -10], {v, -20, 20}, {p, -20, 20},
 Contours → 20, ColorFunction → ColorData["SunsetColors"],
 PlotLegends → BarLegend[Automatic, LegendMarkerSize → 180,
   LegendFunction → "Frame", LegendMargins → 5, LegendLabel → "Temperature(K)"]]
```



```
ContourPlot[T[p, v, 10, 10], {v, -20, 20}, {p, -20, 20},
 Contours → 20, ColorFunction → ColorData["SunsetColors"],
 PlotLegends → BarLegend[Automatic, LegendMarkerSize → 180,
   LegendFunction → "Frame", LegendMargins → 5, LegendLabel → "Temperature(K)"]]
```




```
ContourPlot[T[p, v, -10, -10], {v, -20, 20}, {p, -20, 20},
 Contours → 20, ColorFunction → ColorData["SunsetColors"],
 PlotLegends → BarLegend[Automatic, LegendMarkerSize → 180,
   LegendFunction → "Frame", LegendMargins → 5, LegendLabel → "Temperature(K)"]]
```