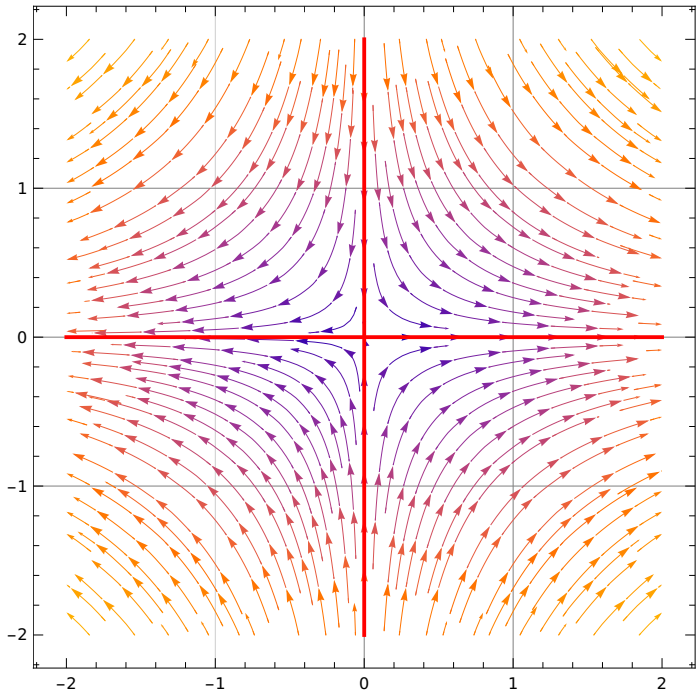
In[1]:=
```
sys = {x'[t] == x[t], y'[t] == -y[t]};

equilibria = Solve[{x[t] == 0, y[t] == 0} /. t → 0, {x[0], y[0]}];

phasePortrait = StreamPlot[{x, -y}, {x, -2, 2}, {y, -2, 2},
 StreamStyle → Gray, StreamPoints → Fine];

separatrices = Plot[
 {0, 0}, {x, -2, 2},
 PlotStyle → {{Red, Thick}, {Red, Thick}}
 ] /. Line[pts_] :→ {Red, Thick, Line[pts]};

sepX = ParametricPlot[{{t, 0}, {0, t}}, {t, -2, 2},
 PlotStyle → {{Red, Thick}, {Red, Thick}}];

Show[phasePortrait, sepX,
 AxesLabel → {"x", "y"}, GridLines → Automatic]
```

Out[6]=



In[16]:=
```
(*\[theta] \[omega]*)
sysPendulum = {θ'[t] == ω[t], ω'[t] == -Sin[θ[t]]};


saddlePoints = Table[{Pi * n, 0}, {n, -1, 1, 2}];


phasePortraitPendulum = StreamPlot[{ω, -Sin[θ]}, {θ, -2 Pi, 2 Pi}, {ω, -3, 3},
 StreamStyle → Gray, StreamPoints → Fine, AspectRatio → 1 / GoldenRatio];


findSeparatrix[point_, eps_, T_] := {
 NDSolveValue[{sysPendulum, {θ[0], ω[0]} == point + eps * {1, 1}}, {θ[t], ω[t]}, {t, 0, T}],
 NDSolveValue[{sysPendulum, {θ[0], ω[0]} == point + eps * {-1, -1}}, {θ[t], ω[t]}, {t, 0, T}],
 NDSolveValue[{sysPendulum, {θ[0], ω[0]} == point + eps * {1, -1}}, {θ[t], ω[t]}, {t, 0, -T}],
 NDSolveValue[{sysPendulum, {θ[0], ω[0]} == point + eps * {-1, 1}}, {θ[t], ω[t]}, {t, 0, -T}]
 };


eps = 10^-3;
T = 8;
{sep1, sep2, sep3, sep4} = findSeparatrix[{Pi, 0}, eps, T];

separatricesPlot = ParametricPlot[
 {sep1, sep2, sep3, sep4},
 {t, 0, T},
 PlotStyle → {{Red, Thick}, {Red, Thick}, {Blue, Thick}, {Blue, Thick}},
 PlotRange → {{-2 Pi, 2 Pi}, {-3, 3}}
 ];


Show[phasePortraitPendulum, separatricesPlot,
 AxesLabel → {"θ", "dθ/dt (ω)"}, GridLines → {{-Pi, Pi}, {0}}]
```

InterpolatingFunction: Input value {0.000163265} lies outside the range of data in the interpolating function. Extrapolation will be used.

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InterpolatingFunction: Input value {0.000163265} lies outside the range of data in the interpolating function. Extrapolation will be used.

General: Further output of InterpolatingFunction::dmval will be suppressed during this calculation.

Out[24]=