```
In[1129]:= f[x_, y_] = y;
       g[x_, y_] = -Sin[x] - σ * y;
       σ = .;
                      0      1
       J[x_, y_] :=              ;
                  -Cos[x]  -σ
       eval = J[π, 0] // Eigenvalues
       Solve[y == 0 && -Sin[x] - 3 * y == 0, {x, y}]
       ReImPlot[{eval[[1]], eval[[2]]}, {σ, 0, 5}]
       Plot[Det[J[π, 0]], {σ, 0, 5}]
       Plot[eval[[1]] + eval[[2]], {σ, 0, 5}]
       Plot[
         (eval[[1]] + eval[[2]])^2 - 4 * (eval[[1]] * eval[[2]]), {σ, 0, 5}]
       StreamPlot[{f[x, y], g[x, y]} /. σ → 3, {x, 0, 2 * π}, {y, -π, π}]
```
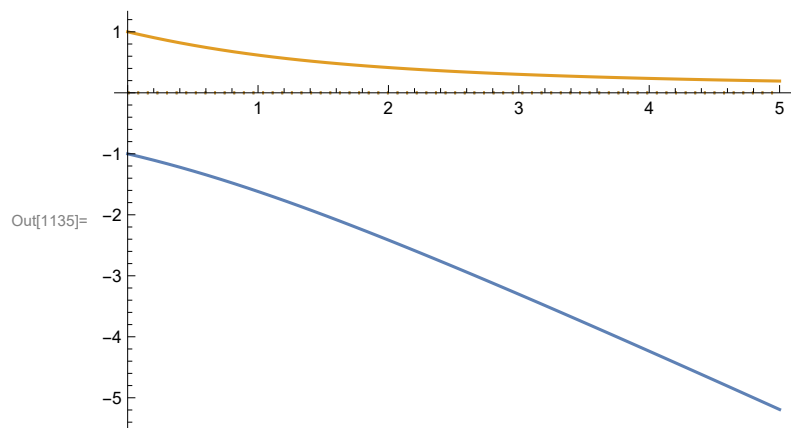
Out[1133]= $\left\{ \frac{1}{2} \left(-\sigma - \sqrt{4 + \sigma^2} \right), \frac{1}{2} \left(-\sigma + \sqrt{4 + \sigma^2} \right) \right\}$

Out[1134]= $\left\{ \left\{ y \to 0, x \to \boxed{2 \pi c_1 \text{ if } c_1 \in \mathbb{Z}} \right\}, \left\{ y \to 0, x \to \boxed{\pi + 2 \pi c_1 \text{ if } c_1 \in \mathbb{Z}} \right\} \right\}$

Out[1135]=

Out[1136]=

Out[1137]=

Out[1138]=

Out[1139]=
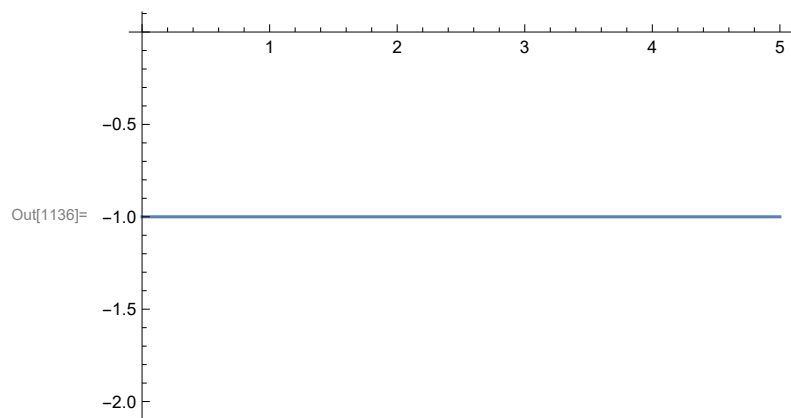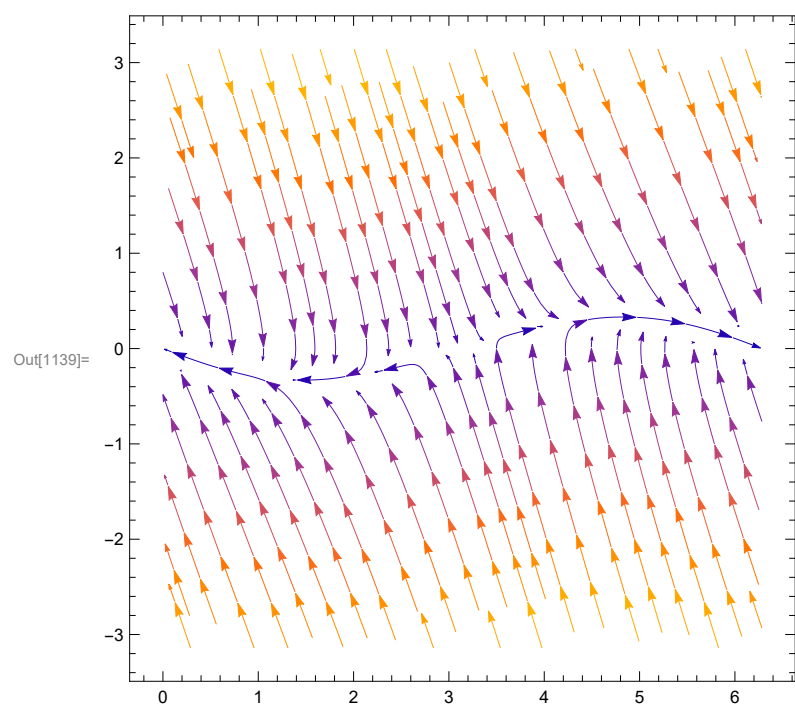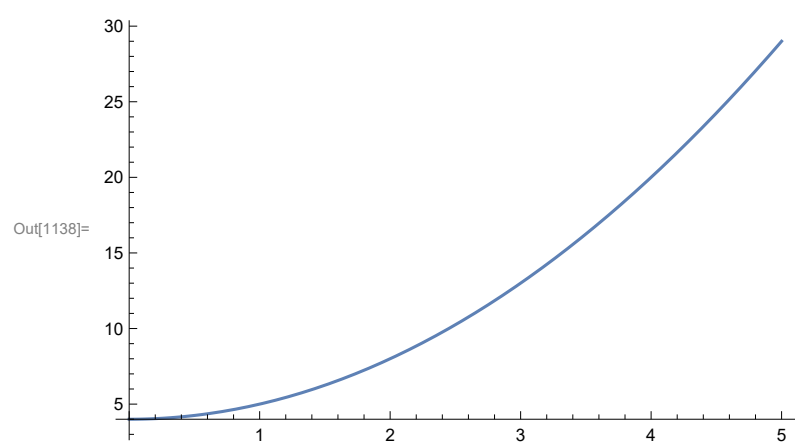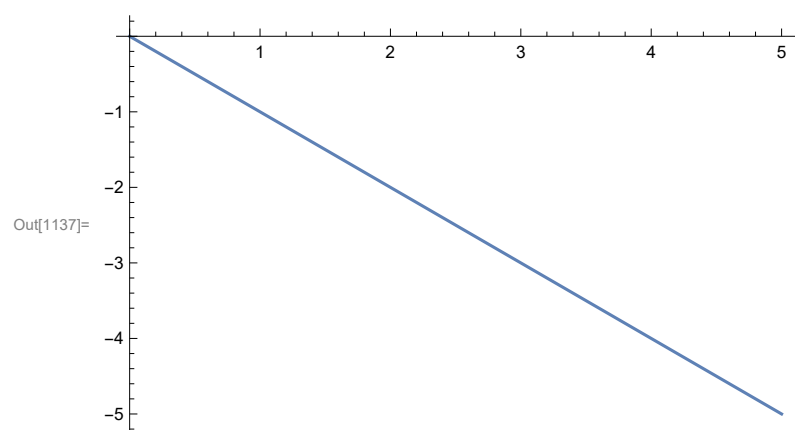
In[1088]:=
```
minx = 0;
maxx = 2 * π;
miny = -π;
maxy = π;
σ = 3;
sol[x0_ , y0_] := NDSolve[{x'[t] == y[t],
    y'[t] == -Sin[x[t]] - σ * y[t] , x[0] == x0 , y[0] == y0}, {x, y} , {t, 0, 10}]
initialCondition = Join[Table[{0, y}, {y , miny , maxy , 0.1}] ,
    Table[{minx, y}, {y , miny , maxy , 0.1}] , Table[{maxx, y}, {y , miny , maxy , 0.1}] ,
    Table[{x, miny}, {x , minx , maxx , 0.1}] , Table[{x, maxy}, {x , minx , maxx , 0.1}]];
Show[Table[ParametricPlot[Evaluate[{x[t], y[t]} /.
    sol[initialCondition[[i, 1]] , initialCondition[[i, 2]]]], {t, 0, 10},
    PlotRange → {{minx, maxx}, {miny, maxy}}] , {i, Length[initialCondition]} ]]
```

Out[1095]=