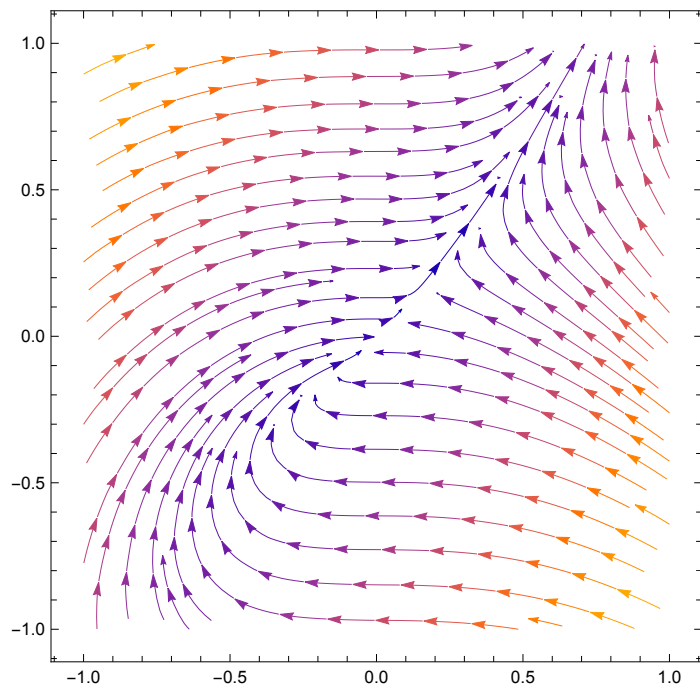


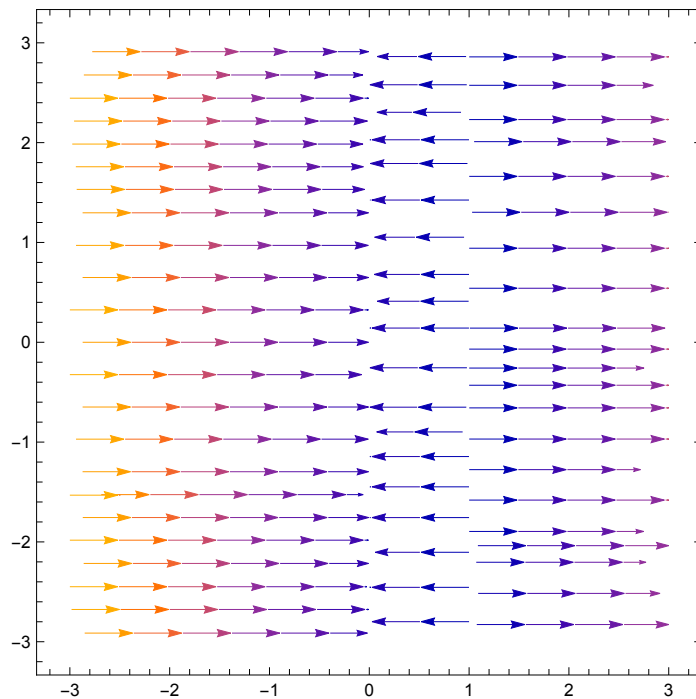
```

(*2.1a*)
(*Give the index for the fixed point of  $x=y-x$ ,  $y=x^2$  *)
f = y - x;
g = x^2;
p1 = StreamPlot[{f, g}, {x, -1, 1}, {y, -1, 1}]
(*Going counterclockwise and using a pen
we see that it never does a full rotation  $\rightarrow$  Idx=0*)

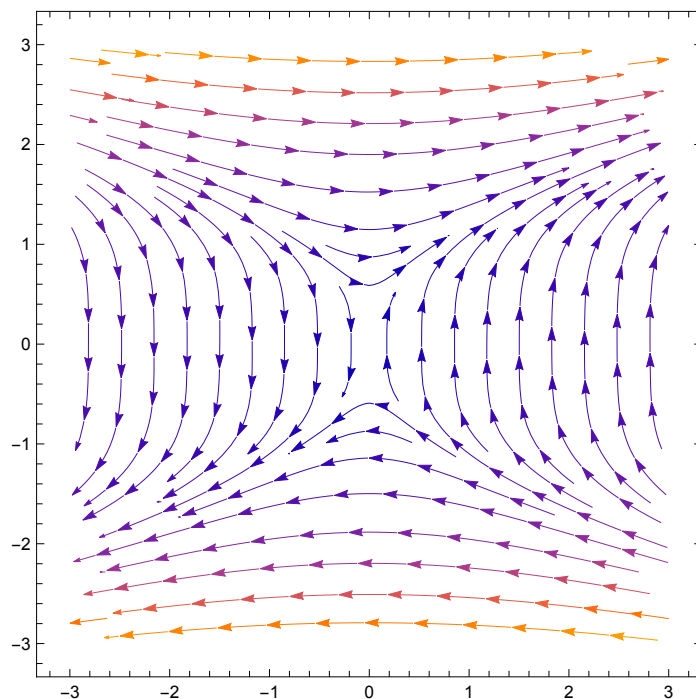
```



```
(*2.1b*)
f1 = a * r + r^2;
p2 = StreamPlot[{f1, 0} /. a → -1, {r, -3, 3}, {θ, -3, 3}]
(*Going counterclockwise and using a pen we see that it does one full rotation
counterclockwise → Idx=1 *)
```



```
(*2.1c*)
p3 = StreamPlot[{y^3, x}, {x, -3, 3}, {y, -3, 3}]
(*Going counterclockwise and using a pen we
see that it does one full rotation clockwise → Idx=-1*)
```



```

(*2.1d*)
f2[x_, y_] := (x^2 + y^2)^(Abs[n] / 2) * Cos[n * ArcTan[y / x]];
g2[x_, y_] := (x^2 + y^2)^(Abs[n] / 2) * Sin[n * ArcTan[y / x]];
φ[x_, y_] := ArcTan[g2[x, y] / f2[x, y]];

Ic = (Integrate[D[φ[1, y], y], {y, -1, 1}] +
      Integrate[D[φ[x, -1], x], {x, -1, 1}] + Integrate[D[φ[-1, y], y],
      {y, 1, -1}] + Integrate[D[φ[x, 1], x], {x, 1, -1}]) / (2 * π)
n

```