

```
> with(plots);
[animate, animate3d, animatecurve, arrow, changecoords, complexplot,
complexplot3d, conformal, conformal3d, contourplot, contourplot3d,
coordplot, coordplot3d, densityplot, display, dualaxisplot, fieldplot,
fieldplot3d, gradplot, gradplot3d, implicitplot, implicitplot3d, inequal,
interactive, interactiveparams, intersectplot, listcontplot, listcontplot3d,
listdensityplot, listplot, listplot3d, loglogplot, logplot, matrixplot, multiple,
odeplot, pareto, plotcompare, pointplot, pointplot3d, polarplot, polygonplot,
polygonplot3d, polyhedra_supported, polyhedraplot, rootlocus, semilogplot,
setcolors, setoptions, setoptions3d, shadebetween, spacecurve,
sparsematrixplot, surfdata, textplot, textplot3d, tubeplot]
```

(1)

```
> pa := 0.1;
pa := 0.1
```

(2)

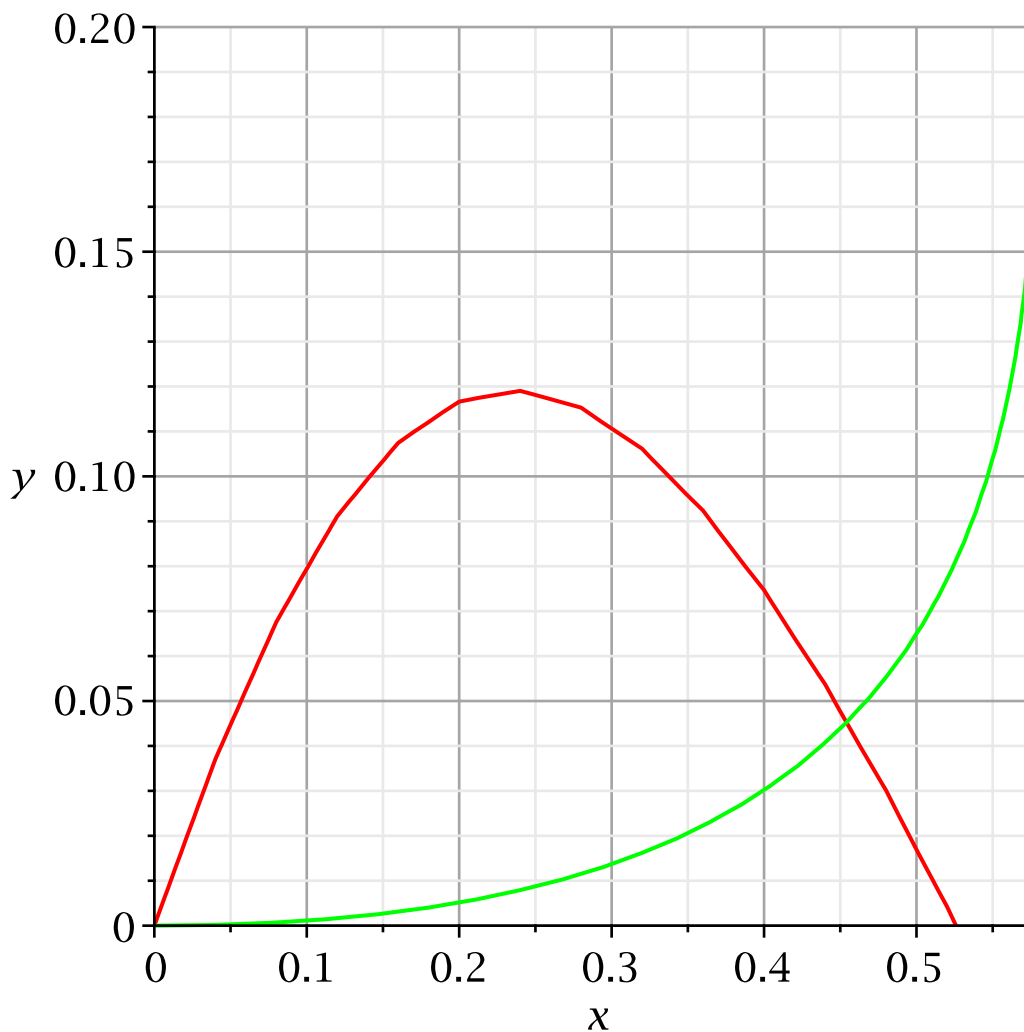
```
> xdot := (x, y) → -y2 - ((pa - 1) · x - 1) · y + ((2 - pa) · x - 1) · x; ydot := (x, y) → y2
+ (x - 1 + pa · x) · y + pa · x2;
```

```
xdot := (x, y) → -y2 - ((pa - 1) x - 1) y + ((2 - pa) x - 1) x
```

```
ydot := (x, y) → y2 + (x - 1 + pa x) y + pa x2
```

(3)

```
> implicitplot([xdot(x, y) = 0, ydot(x, y) = 0], x = 0..1, y = 0..0.2, colour = [red,
green], gridlines)
```



To find which direction flow is going on the x-nullcline (red curve), plug points near the steady state into $ydot$.

First, to the right of the steady state at approximately (0.45, 0.045):

$$\text{> } ydot(0.5, 0.01) \qquad \qquad \qquad 0.0206 \qquad \qquad \qquad (4)$$

So flow is up.

Now, to the left of the steady state:

$$\text{> } ydot(0.4, 0.08) \qquad \qquad \qquad -0.0224 \qquad \qquad \qquad (5)$$

So flow is down.

To find which direction flow is going on the y-nullcline, plug points near the steady state into $xdot$.

First, to the right of the steady state:

$$\text{> } xdot(0.5, 0.07) \qquad \qquad \qquad 0.0716 \qquad \qquad \qquad (6)$$

So flow is to the right.

Now, to the left of the steady state:

| > $\dot{x}(0.4, 0.03)$

-0.0561

(7)

| >

| So flow is to the left.