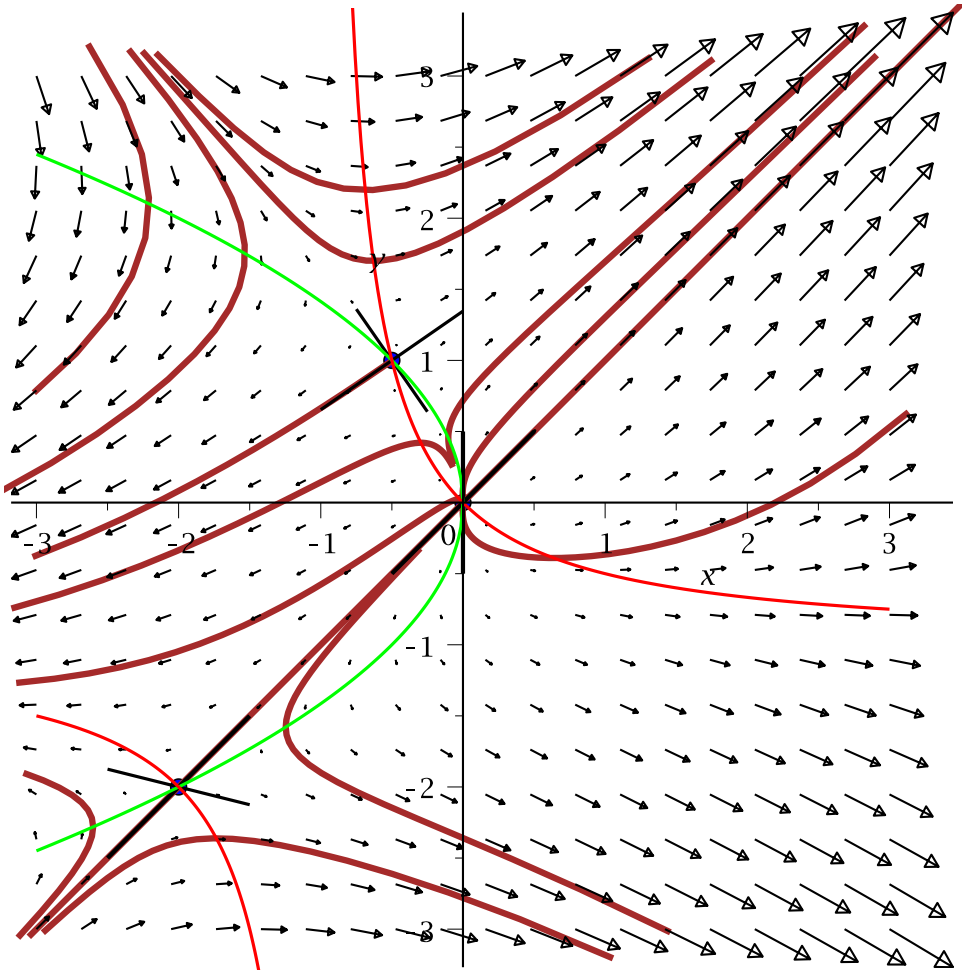
9.3. Example 1: x' = 2x+y^2, y' = x + y + xy.

```
> with(DEtools):with(plots):with(plottools): # Load various
  packages
> # First, I mark the three critical points with small blue disks.
> R:=disk([0,0],0.05,color=blue):
> S1:=disk([-1/2,1],0.05,color=blue):
> S2:=disk([-2,-2],0.05,color=blue):
> # Next I create six black line segments for the eigenspaces of
  the linearizations at each critical point.
> RES1:=line([-1/2, -1/2], [1/2, 1/2], color = black,thickness=2):
> RES2:=line([0, -1/2], [0, 1/2], color = black,thickness=2):
> S2ES1:=line([-2-1/2, -2-1/2], [-2+1/2,-2+1/2], color = black,
  thickness=2):
> S2ES2:=line([-2-1/2, -2+1/8], [-2+1/2,-2-1/8], color = black):
> S1ES1:=line([-1/2+1/2,1+(sqrt(73)-3)/16],[-1/2-1/2,1-(sqrt(73)-3)
  /16],color=black):
> S1ES2:=line([-1/2+1/4,1+(-sqrt(73)-3)/32],[-1/2-1/4,1-(-sqrt(73)
  -3)/32],color=black):
> # Then I create the solutions for several initial conditions.
> solutioncurves:=phaseportrait([D(x)(t) = 2*x(t) + (y(t))^2, D(y)
  (t)= x(t) + y(t) + x(t)*y(t)],[x(t),y(t)],t=-1..5, [[x(0)=-2.2,y
  (0)=3],[x(0)=-2.1,y(0)=3],[x(0)=-2.5,y(0)=3],[x(0)=-2,y(0)=3],[x
  (0)=-1.0,y(0)=-1.1],[x(0)=-2.7,y(0)=-2.8],[x(0)=-2.9,y(0)=-2.8],
  [x(0)=0.1,y(0)=0.1],[x(0)=0.0,y(0)=0.1],[x(0)=-0.1,y(0)=-0.1],[x
  (0)=-0.1,y(0)=0.0],[x(0)=0.0,y(0)=-0.1],[x(0)=-0.1,y(0)=0.5],[x
  (0)=-0.2,y(0)=0.4],[x(0)=-2.5,y(0)=-2.5],[x(0)=-0.51,y(0)=.99]],
  x=-3..3,y=-3..3,linecolor=brown,arrows=none,numpoints=100):
> # Then I create the vector field.
> vectorfield:=fieldplot([2*x+y^2,x+y+x*y],x=-3..3,y=-3..3,arrows=
  slim,anchor=tail,fieldstrength=maximal(2),grid=[20,20]):
> # Below are curves where x' = 0 (green) and y'=0 (red).
> xprime0:=plot([-sqrt(-2*x),sqrt(-2*x)],x=-3..0,color=green):
> yprime0:=plot(-x/(x+1),x=-3..3,color=red,view=[-3..3,-3..3],
  discont=true):
> # Finally, this is all displayed.
> display(solutioncurves,vectorfield,R,S1,S2,RES1,RES2,S1ES1,S1ES2,
  S2ES1,S2ES2,xprime0,yprime0);
```


3
2
1
-1
-2
-3
0
-3
-2
-1
1
2
3
x
y

└>