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> # Max Mekhanikov – 11/5/21 attendance quiz
>
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$$F := [(1-6\cdot x-y)\cdot(3-x-y),\ (3-8\cdot x-3\cdot y)\cdot(1-4\cdot x-6\,y)]$$

$$F := [(1-6\,x-y)\ (3-x-y),\ (3-8\,x-3\,y)\ (1-4\,x-6\,y)] \quad \textbf{(1)}$$

```
> RandNice := proc(var, K) local ra, i :
  ra := rand(1..K) :
  [seq((ra( )-add(ra( )*var[i], i = 1..nops(var)))) * (ra( )-add(ra( )*var[i], i = 1
      ..nops(var))), i = 1..nops(var))] :
  end:
> IsStable := proc(M) local Ei1, i :
  Ei1 := Eigenvalues(evalf(Matrix(M))) :
  evalb(max(seq(coeff(Ei1[i], I, 0), i = 1..nops(M))) < 0) :
  end:
> StEquPts := proc(F, var) local d, pt, E, S, J, i, j, J0, i1, Ei0 :
  d := nops(var) :

  if nops(F) ≠ d then
   RETURN(FAIL) :
  fi:

  E := EquPts(F, var) :
  S := { } :

  J := [seq([seq(diff(F[i], var[j]), j = 1..d)], i = 1..d)] : #J is the general Jacobian


  for pt in E do
   J0 := evalf(subs({seq(var[i1] = pt[i1], i1 = 1..d)}, J)) :
   if IsStable(J0) then
    S := S union {pt} :
   fi:
  od:

  S :
  end:

> EquPts := proc(F, var) local sol, i1 :
  if nops(F) ≠ nops(var) then
   RETURN(FAIL) :
  fi:

  sol := {solve({op(F)}, {op(var)})} :

  {seq(subs(sol[i1], var), i1 = 1..nops(sol))} :
  end:
> F
```

$$[(1-6\,x-y)\ (3-x-y),\ (3-8\,x-3\,y)\ (1-4\,x-6\,y)] \quad \textbf{(2)}$$

```
> EquPts(F, [x, y])
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$$\left\{[0, 1], \left[-\frac{6}{5}, \frac{21}{5}\right], \left[\frac{5}{32}, \frac{1}{16}\right], \left[\frac{17}{2}, -\frac{11}{2}\right]\right\} \quad (3)$$

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> subs({x = 0, y = 1}, F)
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$$[0, 0] \quad (4)$$

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> StEquPts(F, [x, y])
Error, (in StEquPts) cannot determine if this expression is true or
false: max(Eigenvalues(Matrix(2, 2, {(1, 1) = -12., (1, 2) = -2., (2,
1) = 40., (2, 2) = 15.}))[1], Eigenvalues(Matrix(2, 2, {(1, 1) = -12.,
(1, 2) = -2., (2, 1) = 40., (2, 2) = 15.}))[2]) < 0
>
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