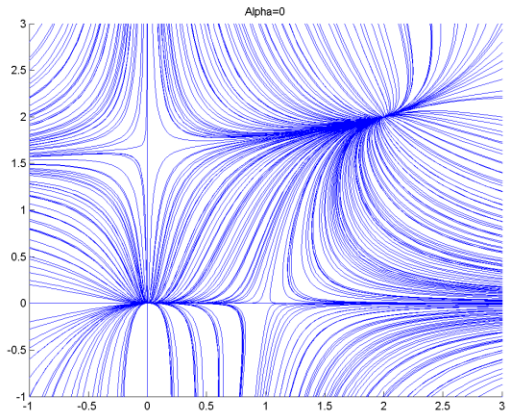
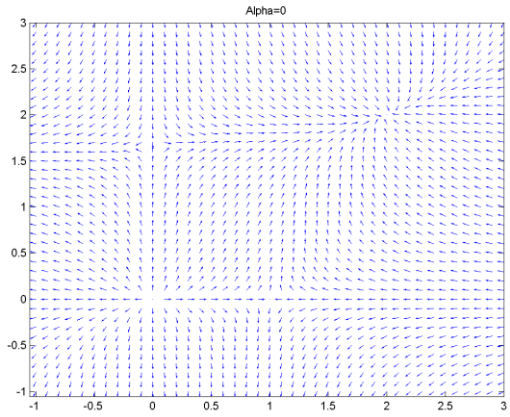
David Craytor

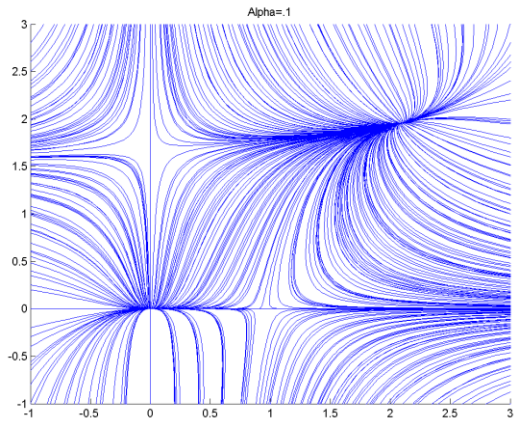


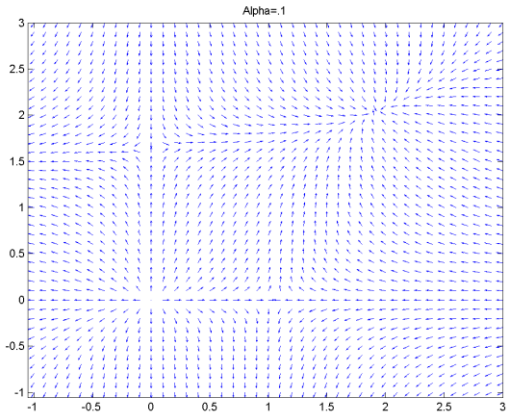


Alpha is equal to zero so we just have the portrait and direction field of the system of chapter 9.4 #6.

Stationary points are located at (0,0),(1,0),(2,2), and (0,5/3). At (0,0) we have a repelling star point.

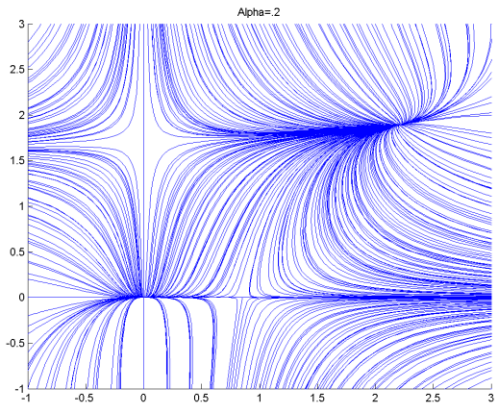
At (1,0) there is a saddle from x=+/-inf towards y=+/-inf. At (2,2) is an attracting node. And at location (0, 5/3) a saddle from y=+/-inf towards x=+/-inf

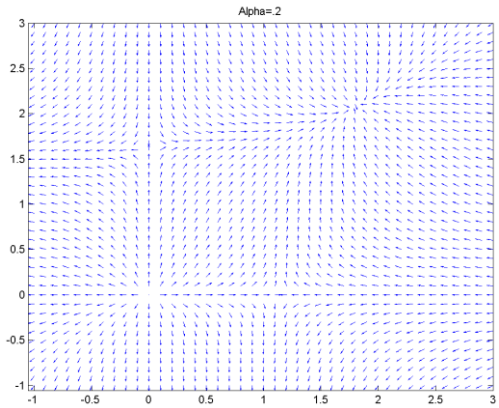




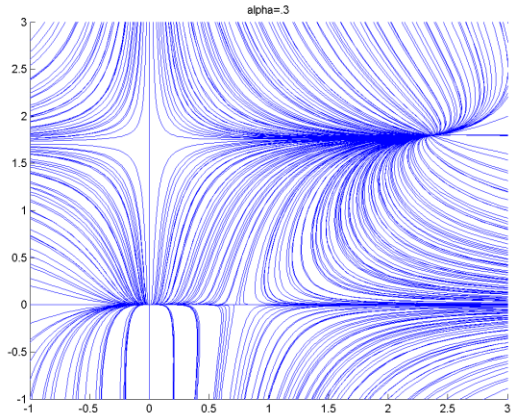
When alpha reaches .1 we begin to see some shifting of most the stationary points. They will be numbered 1-4.

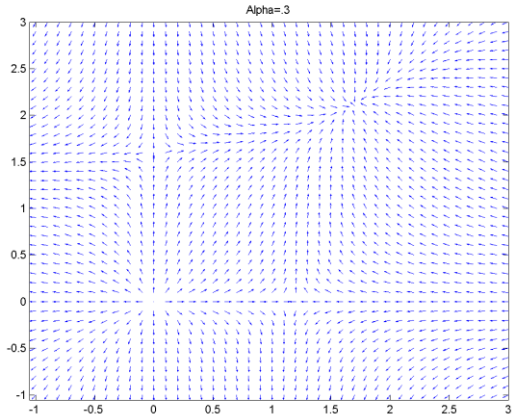
1) Stationary point [0 0] lies in the original location and still remains a repelling star point with slight very slight changes.
2) The stationary point at [1.0 0] is also in the same location and has changed very little.
3) Stationary point [2.0 2.0] is also in the same place and it too pretty much stays the same.
4) However at [0 1.67] we see our first change in location, since it used to lie on the point (0,5/3). It still remains a saddle of the same kind as it was at alpha=zero.



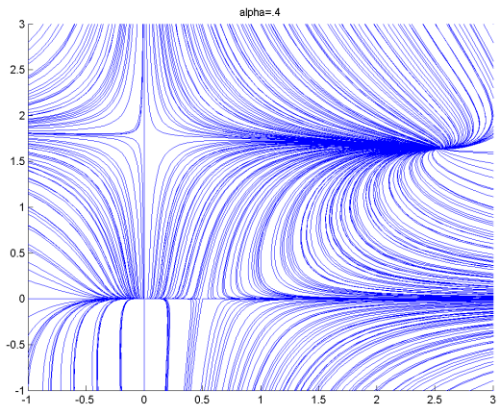


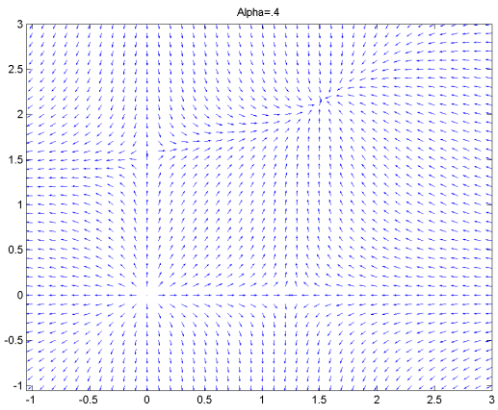
When alpha=2 stationary point number 1 is still at zero and still remains a star point. Number 2 still remains a saddle with its original properties as it makes its way towards stationary point number 2. In the top left corner number 3 remains a node dispite what appears to be drastice change. And number 4 is still a saddle with its orignal behavior.



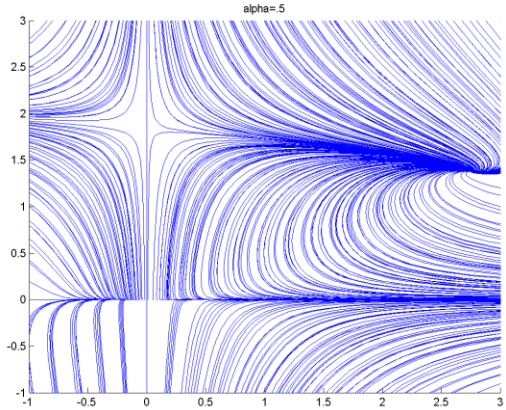


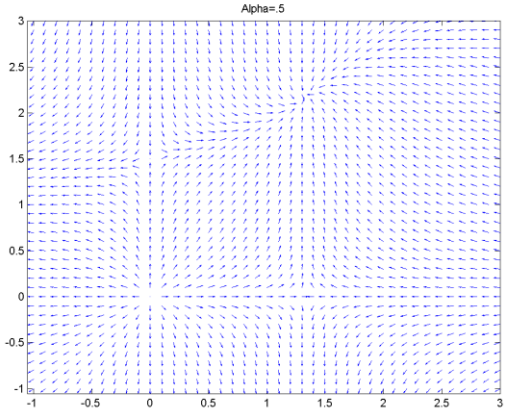
We see here at alpha=3 that number 1 is clearly being pressured, though it remains in the same location. Number 2 is continuing to move towards the first stationary point. Number three seems to be moving forward with a change in behavior, however for now it is still an attracting node. And stationary point number 4 lies within an ideal saddle.



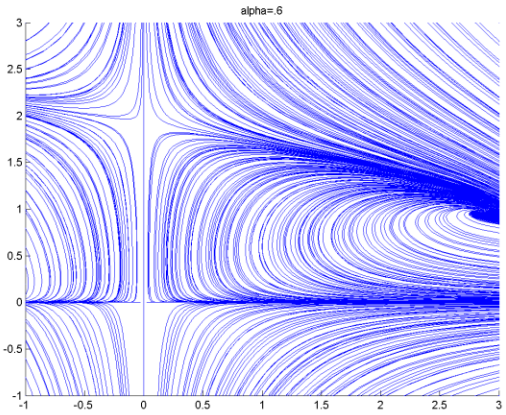


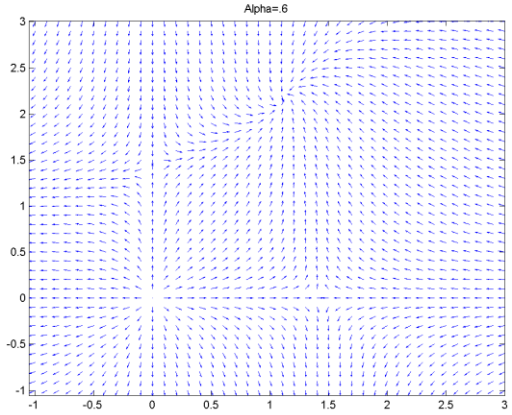
As we approach alpha=.5 we begine to see something interesting changes. Number 1 is still a star point at the orgin continuing to repel. Number 2 is still the same old saddle but it is under the influence of the node which is beginning to look more like an attracting Twist. If it contines to change in this manner it is bound to become an attracting spiral node of the clockwise direction. And number 4 is till free to take up the saddle form as it has from the start.



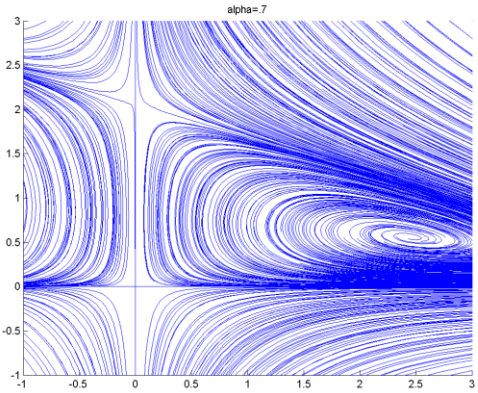


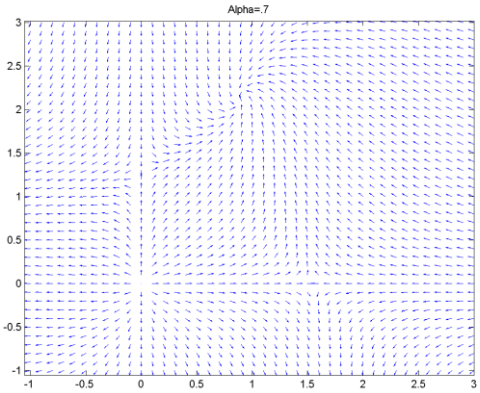
We are beginning to see some conflicts between number 1, 2 and 4. The direction field insists that number 1 has not moved however, it can be seen from the portrait that the saddle of number 2 is becoming a powerful influence over number 1. Number 1 and 4 also have conflicting field lines between them. So far though everything remains as it was from the start except for number 3. It is now an attracint clockwise twist and well on its way towards taking up the form of a spira



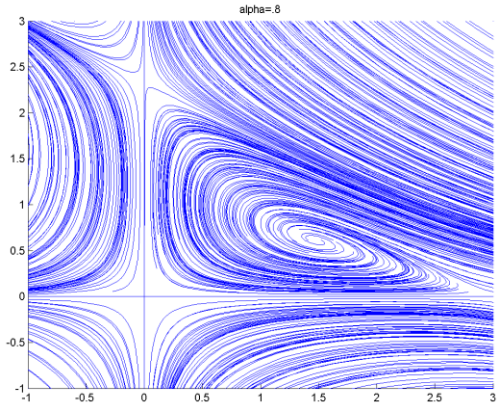


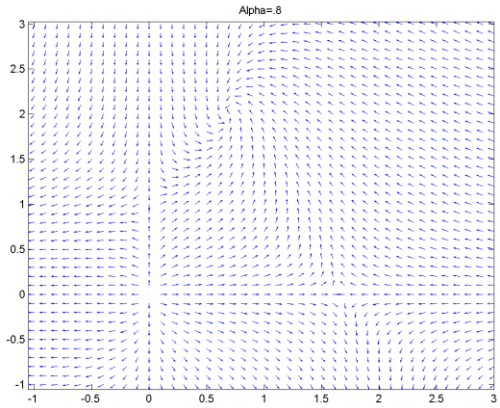
Number 1 seems to have become a node. A repelling node seems to have developed around the in consequence of the joining of the saddle at number 2 with the star point at number 1 and with some help from the saddle at number 4. At number 3 it is almost a clockwise spiral node.



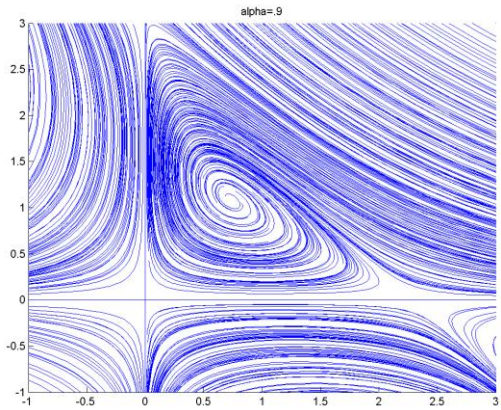


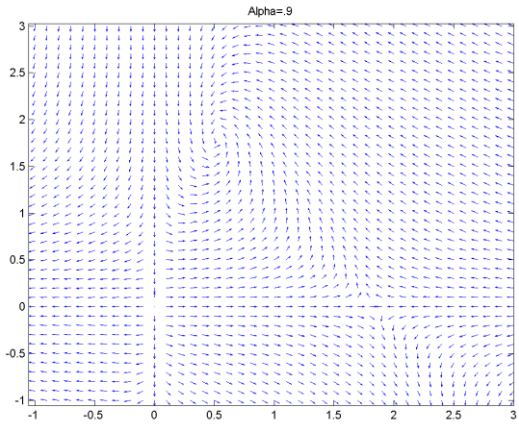
Number 3 is now clearly an attracting clockwise spiral node. At the origin lies a saddle now. It seems to work with the saddle of number on in that the direction fields do not conflict. It seems the node at number 1, or number 2 have disappeared. If it were my guess I would say that the 2 saddles that conflicted with the star node were enough to neutralize it.



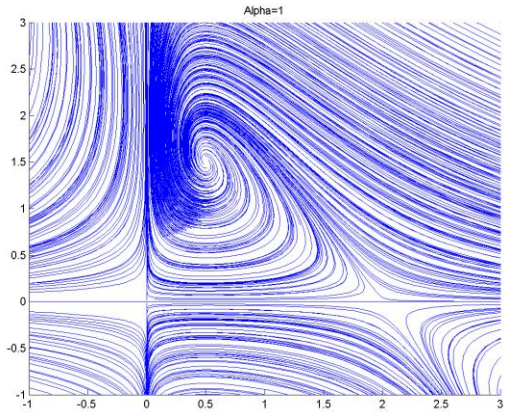


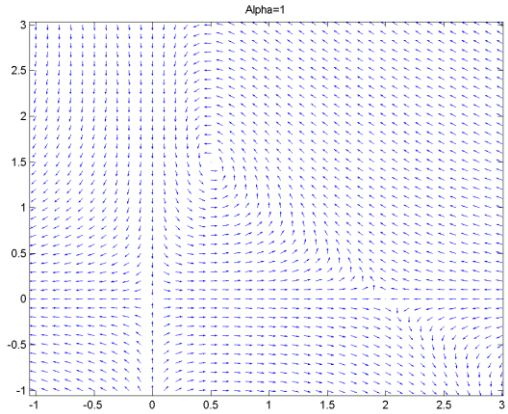
We see only 3 stationary ponts, however one there might be one over on the far right on the x axis. I assume the node that was once at the origin is no more. The spiral node is still counter clockwise, and it is beginning to distort the saddle at stationary point number 4. The saddle at the origin does not seem to be greatly affected by the spiral node. And the spiral node seems to have changed directions. It is now moving counter clockwise.





A new saddle has appeared on the far right on the x axis. It looks to be of the sort that comes from the extremes in the x direction only to be driven to the extremes in the y direction. However this would only be the case if it were not under the influence of the attracting counterclockwise spiral node. Here we see distortions. The saddle at the x axis has not changed too much however the saddle that was once above appears to be forced off the map. By extending the plot it is seen that this saddle is going to be annihilated by the spiral node moving toward it.





=

In the end we have the portrait and the direction field of the 2nd set of equations from 9.5#3. There are 3 stationary points. One at (0,0) is a saddle coming from the y extremes and out towards the x extremes. (2,0) is also a saddle however it is as it was described before and still under the distorting influence of the attracting counterclockwise spiral node at (0.5,1.5).