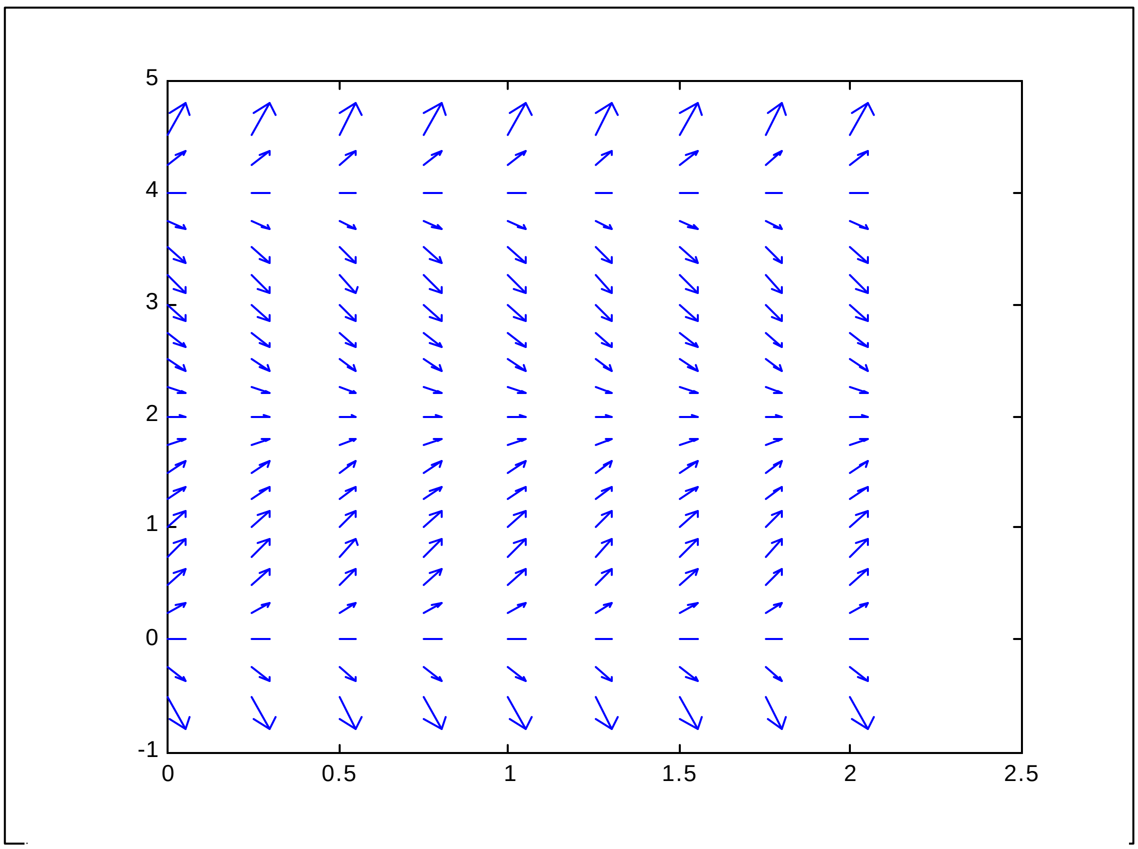
Solution of ODEs via Direction Fields

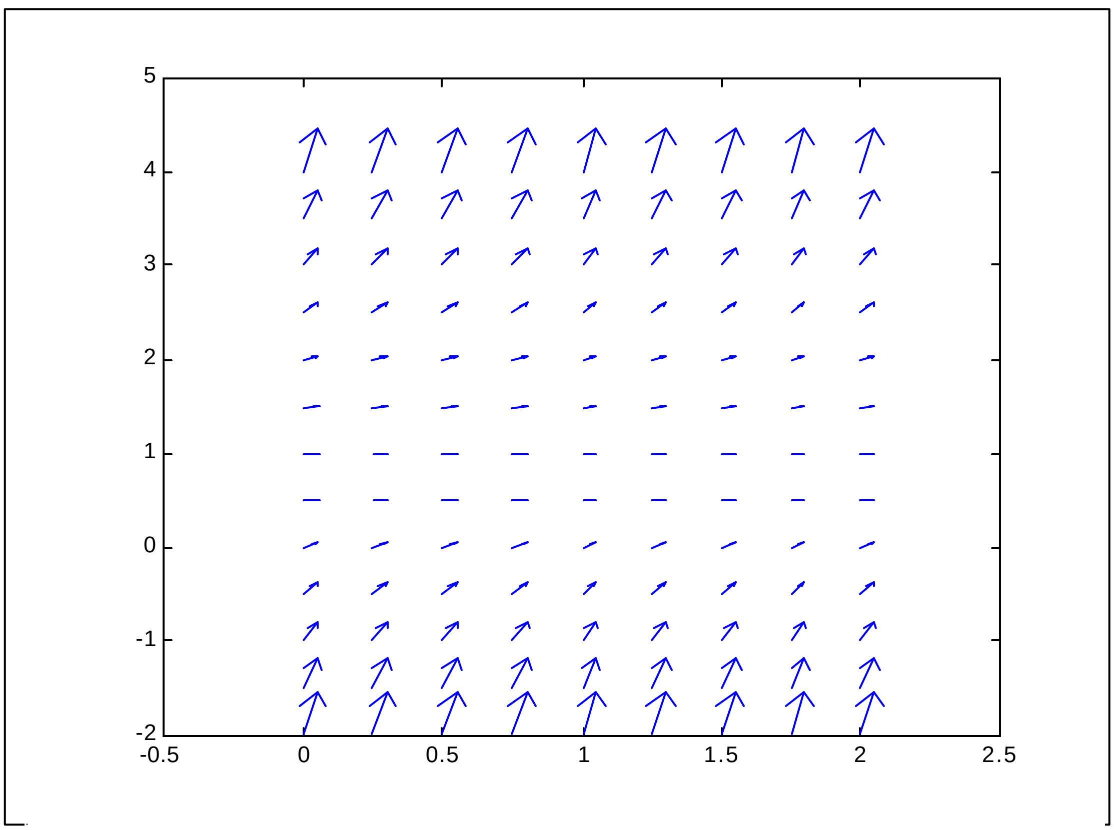
Direction Field for y’ = y(y-2)(y-4):

```
% clears matlab's memory
clear;
% creates grid points in the ty-plane
[t y]= meshgrid(0.:.25:2.,-.5:.25:4.5);
% creates slope of all direction vectors
slope = y.*(y-2).*(y-4);
% plots direction vectors at all grid points
quiver(t,y,ones(size(t)),slope)
```



Direction Field for y’ = $(y - 1)^2$:

```
%  clears matlab's memory
clear;
%  creates grid points in the ty-plane
[t y]= meshgrid(0.:.25:2.,-2.:.5:4.);
%  creates slope of all direction
vectors
slope = (y-1).^2;
%  plots direction vectors at all grid
points
quiver(t,y,ones(size(t)),slope)
```



Alligator Problem

$y' = (1/3200)(1500-y)y - s$

Use solve to find the steady state solutions:

```
EDU» solve('(1/3200)*(1500-y)*y-s=0','y')

ans =

[ 750+10*(5625-32*s)^(1/2)]
[ 750-10*(5625-32*s)^(1/2)]
```

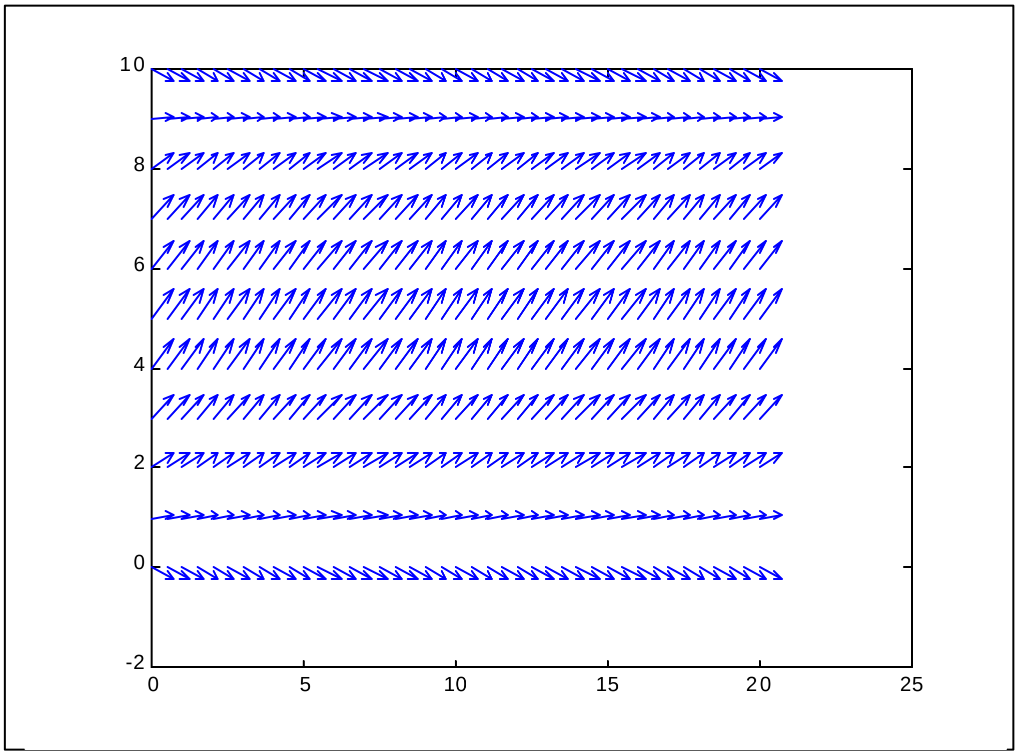
Scale the differential equation so that the direction field is readable:

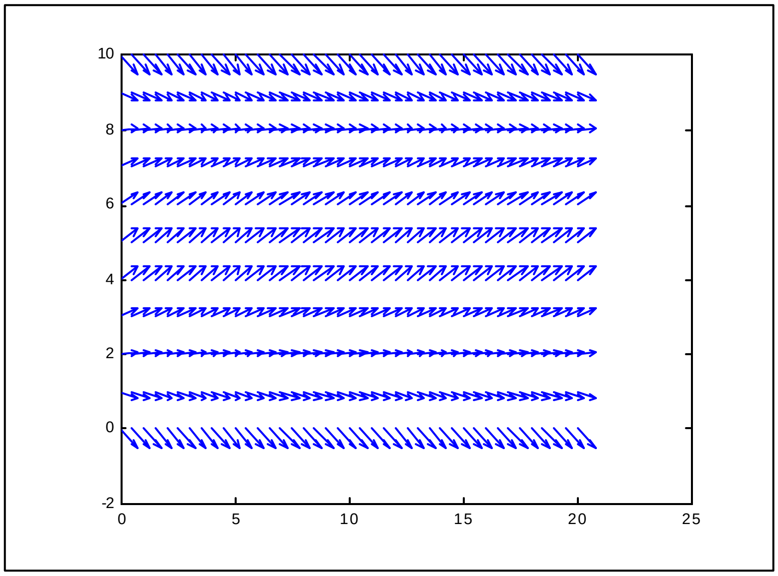
new y = y/150

new differential equation

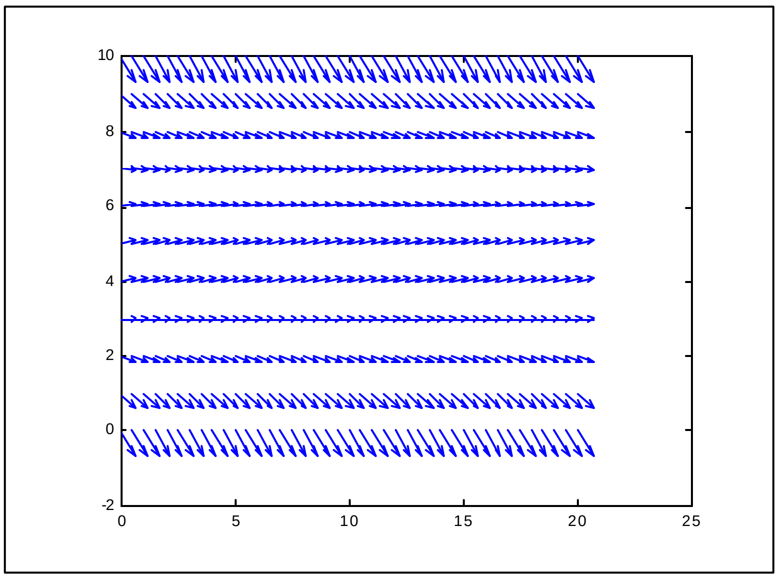
$$y' = (150/3200)(10 - y)y - s/150$$

```
%  clears matlab's memory
clear;
%  creates grid points in the ty-plane
[t y]= meshgrid(0.:.5:20,0:1:10);
%  creates slope of all direction
vectors
slope = (150/3200)*(10 - y).*y- 50/150;
%  plots direction vectors at all grid
points
quiver(t,y,ones(size(t)),slope)
```

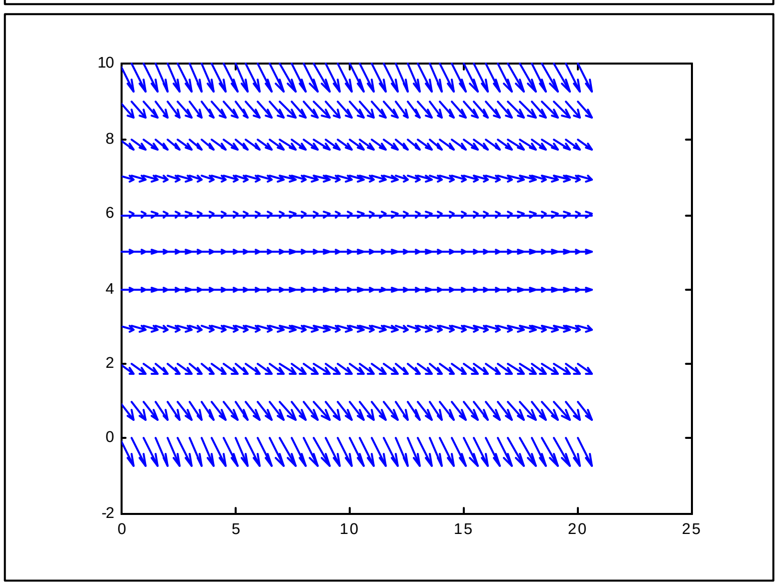




S = 100



S = 150



S = 175