**Tangent Vectors via quiver**

**QUIVER** Quiver plot.

**QUIVER***(X,Y,U,V)* plots velocity vectors as arrows with components (u,v) at the points (x,y). The matrices X,Y,U,V must all be the same size and contain corresponding position and velocity components (X and Y can also be vectors to specify a uniform grid). **QUIVER** automatically scales the arrows to fit within the grid.

EDU» x = [ 1 12];
EDU» y = [1 2];
EDU» u = [3 4];
EDU» v = [4 6];
EDU» quiver(x,y,u,v)
Direction Field for $y' = .1(10 - y)y - 1$
(Population with Harvesting):

EDU» edit quiverde.m

% clears matlab's memory
clear;

% creates grid points in the ty-plane
[t y] = meshgrid(0:1:20,-1:1:12);

% creates slope of all direction vectors
slope = (1/10)*(10-y).*y - 1;

% plots direction vectors at all grid points
quiver(t,y,ones(size(t)),slope)
Direction Field for $y' = 0.01(70 - y)$
(Newton’s Law of Cooling):

```matlab
% clears matlab's memory
clear;
% creates grid points in the ty-plane
[t y] = meshgrid(0:10:400,0:10:210);
% creates slope of all direction vectors
slope = (0.01)*(70-y) ;
% plots direction vectors at all grid points
quiver(t,y,ones(size(t)),slope)
```
Direction Field for $y' = 3y^{2/3}$
(Multiple Solutions for $y(2) = 0$
$y = 0$ and $y = (t-2)^3$):

% clears matlab's memory
clear;
% creates grid points in the ty-plane
[t y]= meshgrid(2:.5:6.,.0:.5:2);
% creates slope of all direction vectors
slope = 3*y.^(3/2) ;
% plots direction vectors at all grid points
quiver(t,y,ones(size(t)),slope)
Direction Field for $y' = (y+1)^2$
(Solution Blows Up $y = 1/(1-t) - 1$):

```matlab
% clears matlab's memory
clear;
% creates grid points in the ty-plane
[t y]= meshgrid(0:.1:1.,-.5:.25:3);
% creates slope of all direction vectors
slope = (y+1).^2;
% plots direction vectors at all grid points
quiver(t,y,ones(size(t)),slope)
```