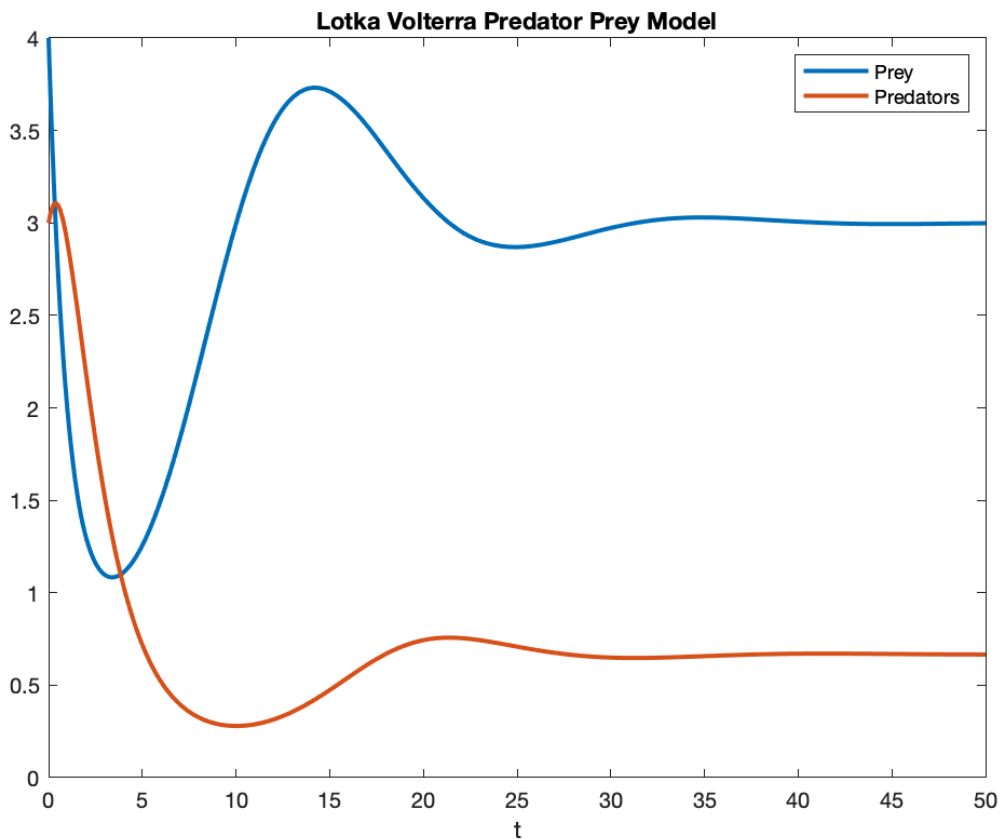


Lotka-Volterra Predator Prey Model With Logistic Growth for Prey

$$x' = ax - px^2 - bxy, \quad y' = mxy - ny \quad \text{with } a, b, m, n > 0$$

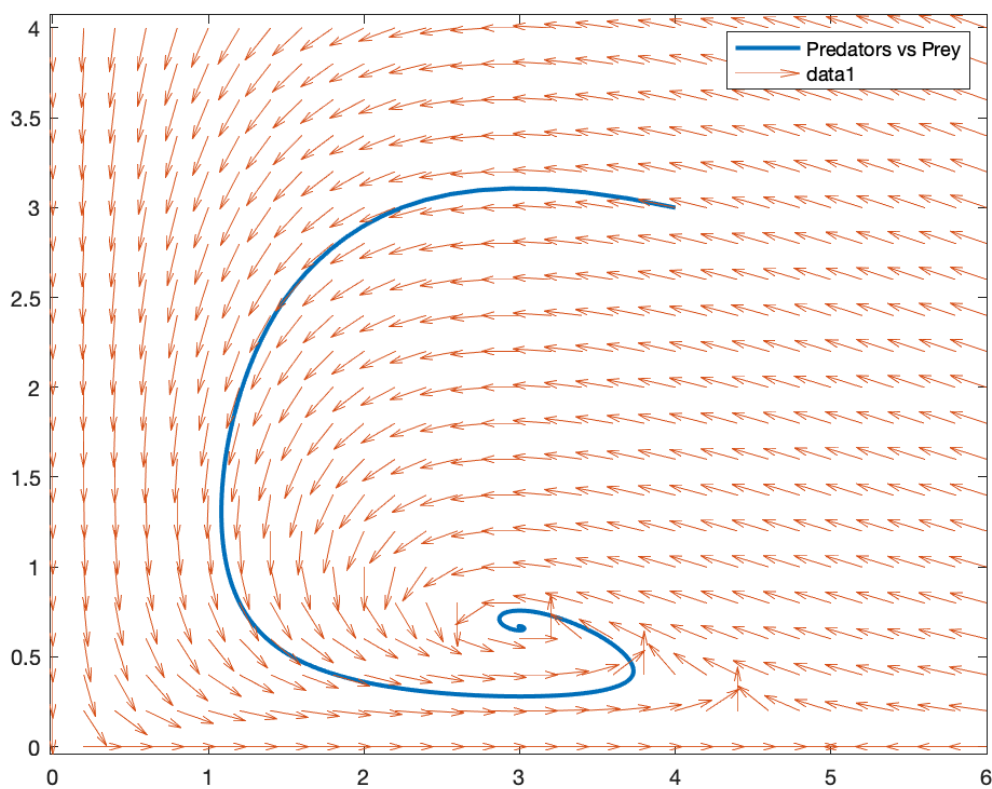
```
% Set Initial values
x10 = 4;
x20 = 3;

% Set Values for Parameters
a = 1/2;
b = 3/10;
m = 1/5;
n = 3/5;
p = 1/10;
IC = [x10, x20];
tspan = 0: .1: 50;
[tSoln, xSoln] = ode45( @(t,x) LotkaVolterraLog(t,x, a,b, m,n,p),tspan, IC);
figure;
plot(tSoln, xSoln, 'LineWidth', 2), xlabel('t'), legend('Prey', 'Predators')
title('Lotka Volterra Predator Prey Model with Logistic Growth for Prey')
```



Plot Phase Portrait and Trajectory

```
figure;  
plot(xSoln(:,1), xSoln(:,2), 'LineWidth', 2)  
legend('Predators vs Prey')  
axis tight  
hold on  
  
[x,y]=meshgrid(0:.2:6,0:.2:4);  
xprime=a * x - p * x.^2 - b * x.*y;  
yprime=-n.*y + m.*x.*y;  
L = sqrt(xprime.^2 + yprime.^2);  
dyu=yprime./L;  
dxu=xprime./L;  
quiver(x,y,dxu,dyu)  
hold off
```



Define The Model

```
function dx = LotkaVolterraLog(t,x, a, b, m, n, p)
% Predator-Prey with Logistic for Prey
dx = [a * x(1) - p* x(1).* x(1)- b * x(1) .* x(2)
m * x(1) .* x(2) - n * x(2)];
end
```