Project 2

Names Here

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Part 1: Deriving Conclusions from the Model

Part 1 goes here.

Part 2: Visualizing with MATLAB Solvers

$S' = -\beta\sqrt{S\,I}$,
$I' = \beta\sqrt{S\,I} - r\sqrt{I}$,
$S(0) = S_0, I(0) = I_0$,

Specify initial conditions and model parameters. For this problem, in the code we have `x=[x(1),x(2)]`=$[S, I]$, `x10`= S_0, and `x20` $= I_0$.

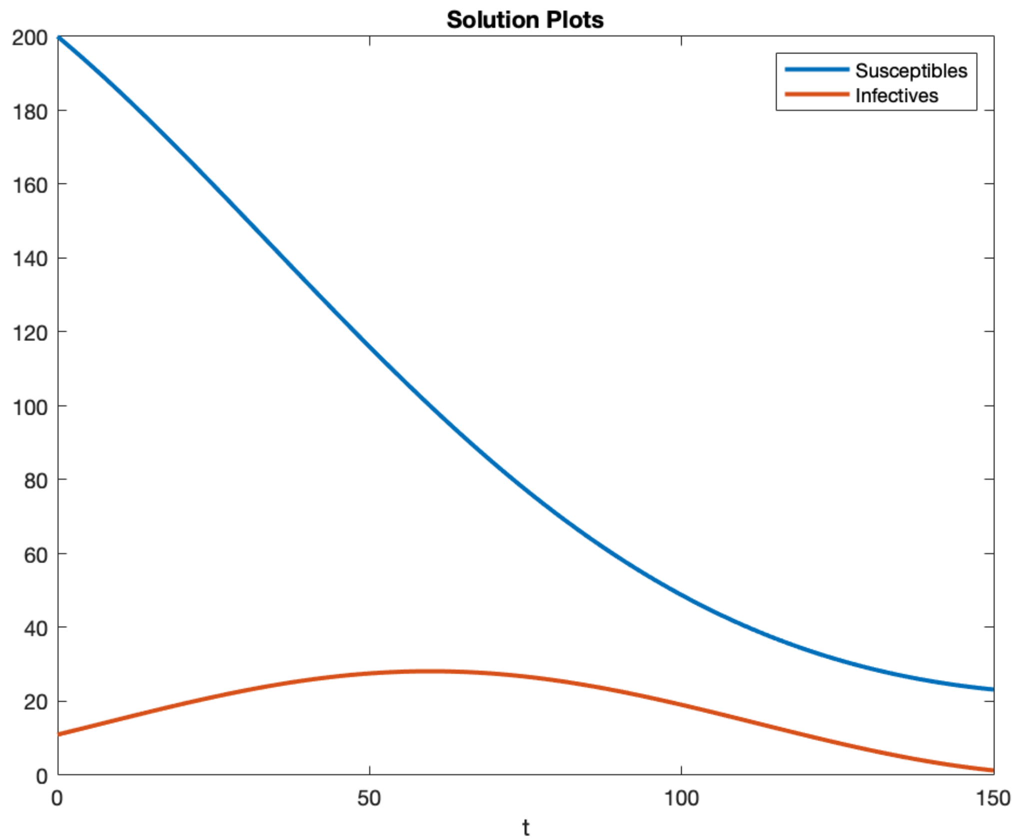
```
x10 = 200;
x20 = 11;
beta = 0.03;
r = 0.3;
```

Compute solution with MATLAB's ode45. Note that myModel is a function (defined in the last section) that represents the differential equation.

```
IC = [x10 x20];
tSpan=0:150;
[tSoln,xSoln] = ode45(@(t,x) myModel(t,x,beta,r),tSpan,IC);
```

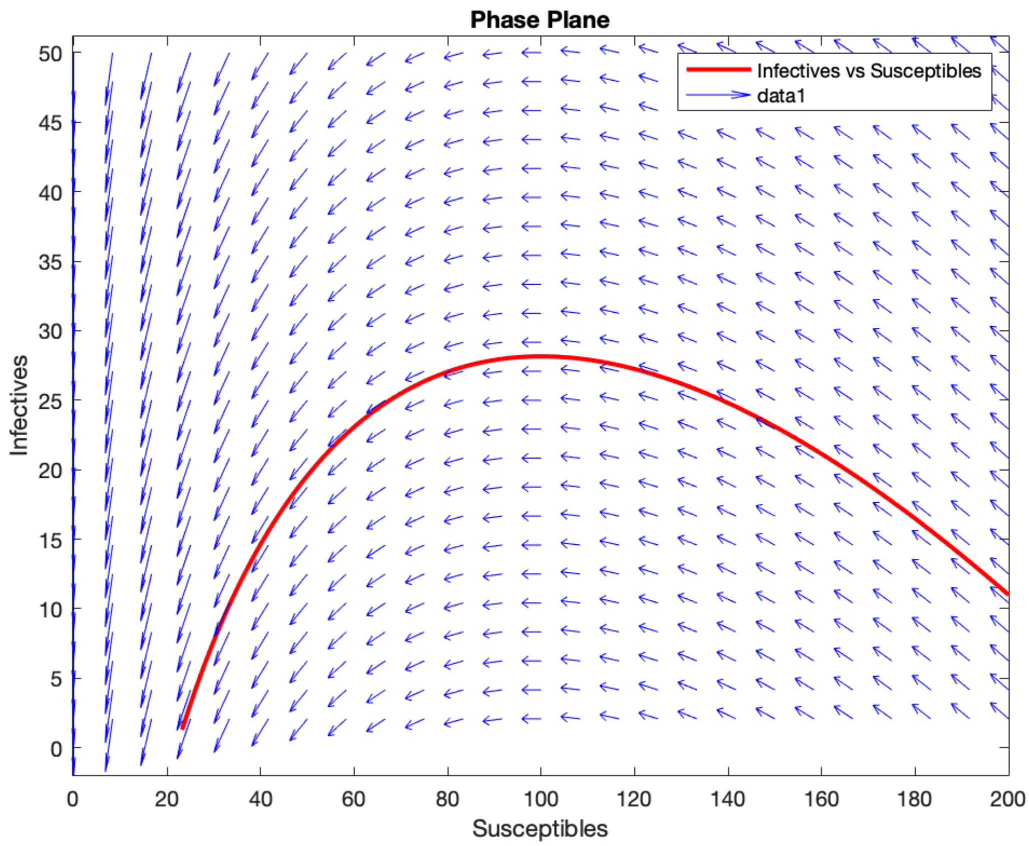
Plot of how solutions evolve over time.

```
figure;
plot(tSoln,xSoln,'LineWidth',2.0), xlabel('t'),legend('Susceptibles', 'Infectives')
title('Solution Plots')
```



Phase plane visualization with given initial condition.

```
figure;
plot(xSoln(:,1), xSoln(:,2),'r', 'LineWidth',2.0), legend('Infectives vs Susceptibles')
hold on;
[X,Y] = meshgrid(linspace(0,200,25),linspace(0,50,25));
u = -beta * sqrt(X).*sqrt(Y);
v = beta * sqrt(X).*sqrt(Y) - r * sqrt(Y);
L = sqrt(dX.^2+dY.^2);
quiver(X,Y,u./L,v./L,0.5,'b')
axis tight
xlabel('Susceptibles'), ylabel('Infectives')
title('Phase Plane')
```



Part 3: Convert To a Solvable Linear Model

Part 3 goes here

Part 4: Modified Model

Part 4 goes here

Appendix: Model Functions

```
function dx = myModel(t,x,beta,r)
% Susceptibles = x(1), Infectives = x(2)
    dx = [-beta * sqrt( x(1) ) * sqrt( x(2) )
    beta * sqrt( x(1) ) * sqrt( x(2)) - r * sqrt( x(2) )];
end
```