

```
clc; clear; close all;

%Fixed Parameters
data = load('epidata.mat');
A = data.A;
G = graph(A);
I = 6;
rec_day = 4;
day_x = 1:30;
day = 30;
```

```
%3a)
% Recall  $R_0 = p * k$ 
% Let k be mean degree of network
k = mean(degree(G))
```

```
k = 4
```

```
% For  $p = 0.3$ ,
p1 = 0.3;
R0_1 = p1*k
```

```
R0_1 = 1.2000
```

```
% For  $p = 0.6$ ,
p2 = 0.6;
R0_2 = p2*k
```

```
R0_2 = 2.4000
```

```
%3b)
type = 'SIR'; % 'SIR' or 'SIS'
% For  $p = 0.3$ 
[nS1 nI1 nR1] = epidemic(A, I, p1, rec_day, day, type);
```

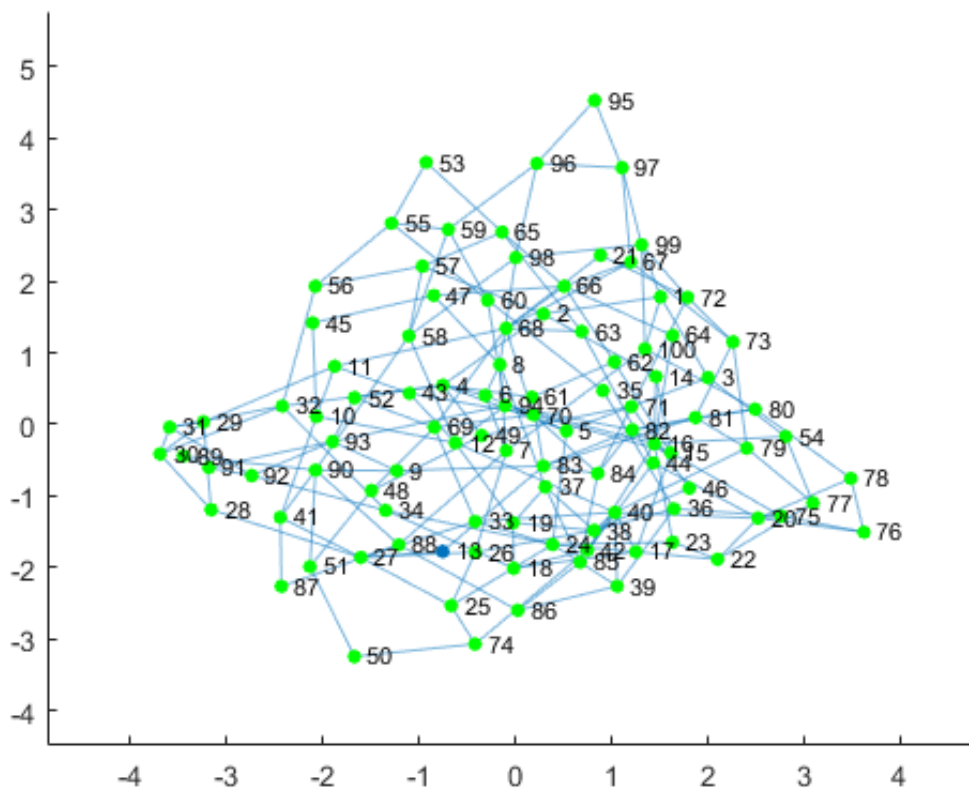
```
v =  
VideoWriter
```

General Properties:

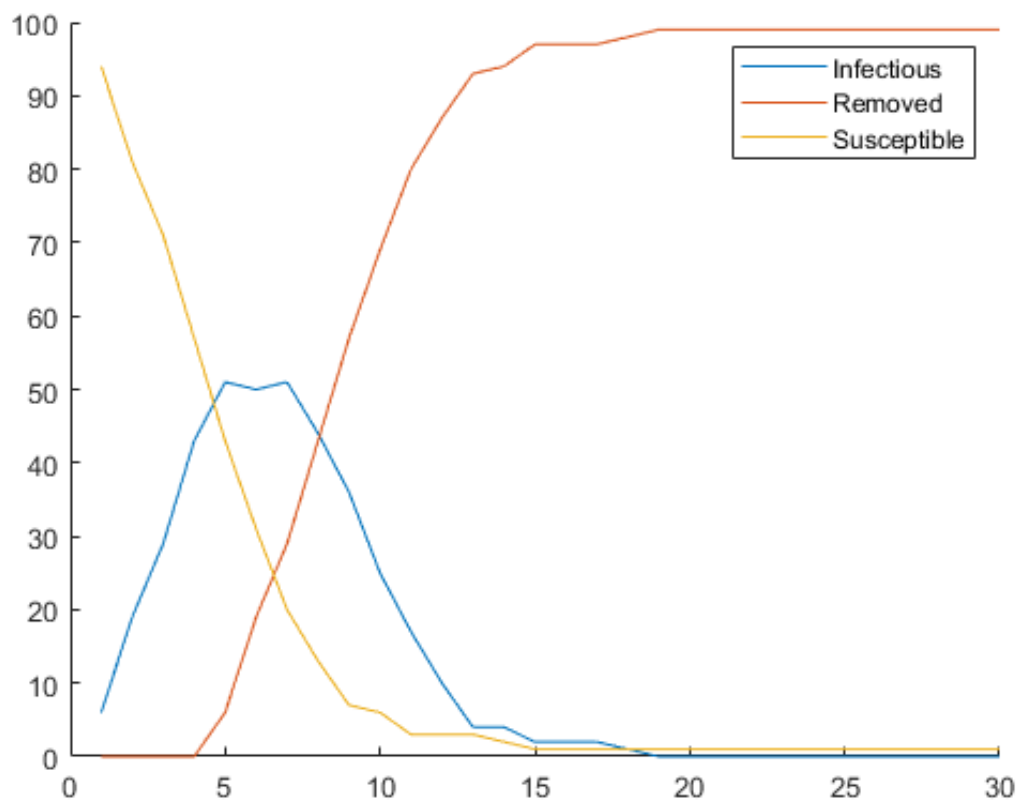
```
Filename:          'record.avi'  
Path:              'C:\Users\ethan\OneDrive\Documents\University  
FileFormat:        'avi'  
Duration:          0
```

Video Properties:

```
ColorChannels:      3  
Height:             []  
Width:              []  
FrameCount:         0  
FrameRate:          10  
VideoBitsPerPixel:  24  
VideoFormat:        'RGB24'  
VideoCompression:  'MPEG-4' (H.264)
```



```
plot(day_x,nI1, day_x,nR1, day_x,nS1)  
legend('Infectious', 'Removed', 'Susceptible')
```



```
% For p = 0.6
```

```
[nS2 nI2 nR2] = epidemic(A, I, p2, rec_day, day, type);
```

```
v =
```

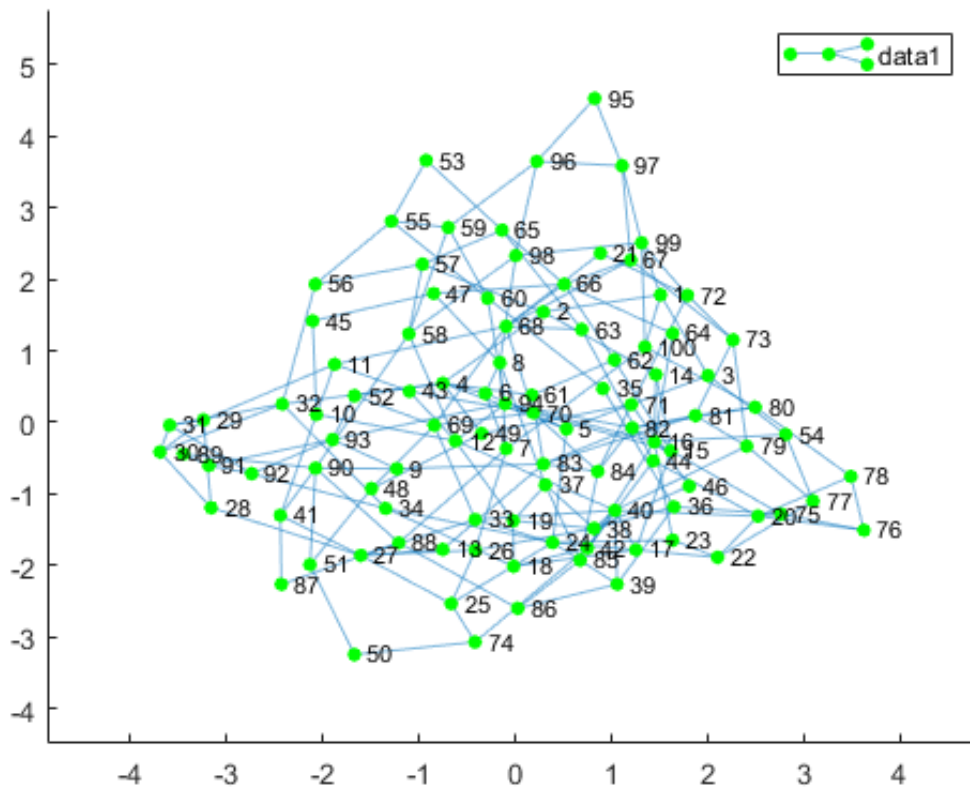
```
VideoWriter
```

General Properties:

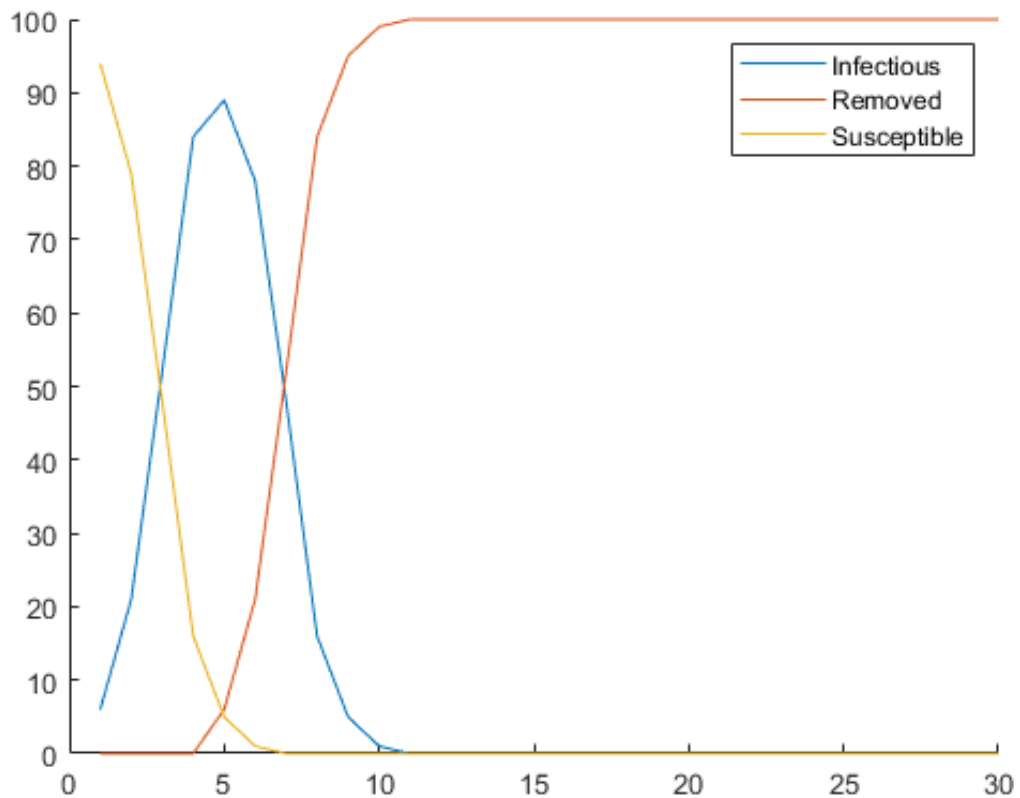
Filename:	'record.avi'
Path:	'C:\Users\ethan\OneDrive\Documents\University
FileFormat:	'avi'
Duration:	0

Video Properties:

ColorChannels:	3
Height:	[]
Width:	[]
FrameCount:	0
FrameRate:	10
VideoBitsPerPixel:	24
VideoFormat:	'RGB24'
VideoCompressionMethod:	'H.264'



```
plot(day_x,nI2, day_x,nR2, day_x,nS2)
legend('Infectious', 'Removed', 'Susceptible')
```



```
% As the probability of infection is higher for  $p = 0.6$ , the time taken to  
% spread is much lower, hence the higher peak of the infectious plot line  
% for  $p = 0.6$  (roughly 80) than for  $p = 0.3$  (roughly 60). Additionally,  
% since the disease spreads more quickly, it also dies out much faster as  
% the number of susceptible nodes decreases much more quickly.
```

```
%3c)  
type = 'SIS'; % 'SIR' or 'SIS'  
day = 60;  
day_x = 1:60;  
% For  $p = 0.3$   
[nS3 nI3 nR3] = epidemic(A, I, p1, rec_day, day, type);
```

```
v =
```

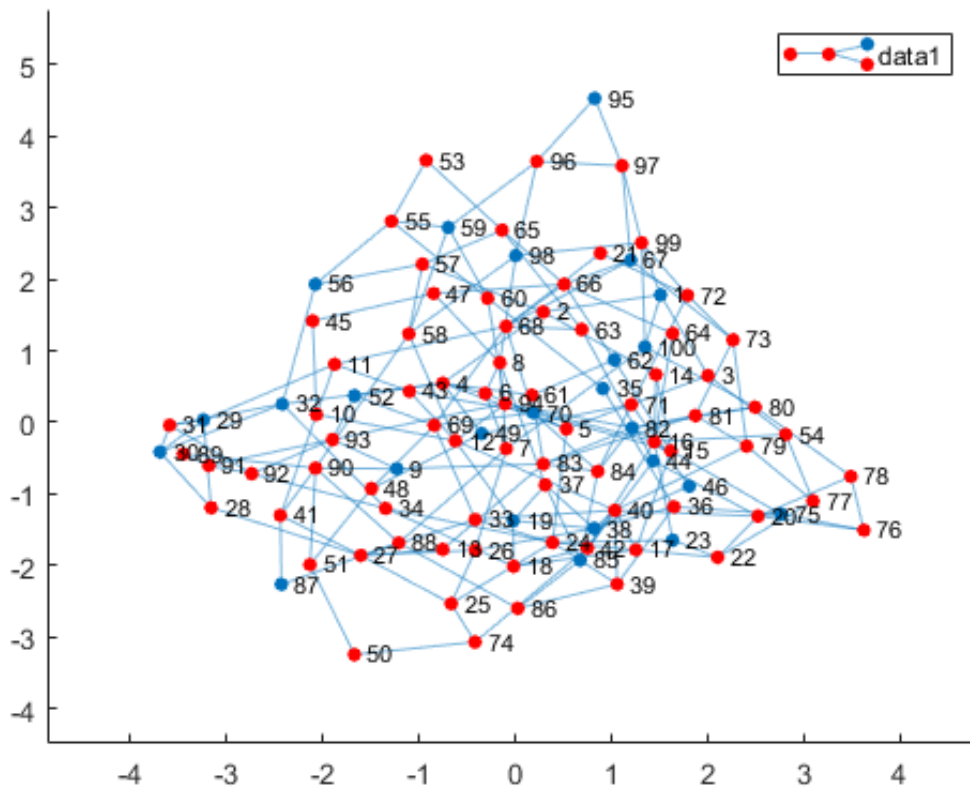
```
VideoWriter
```

General Properties:

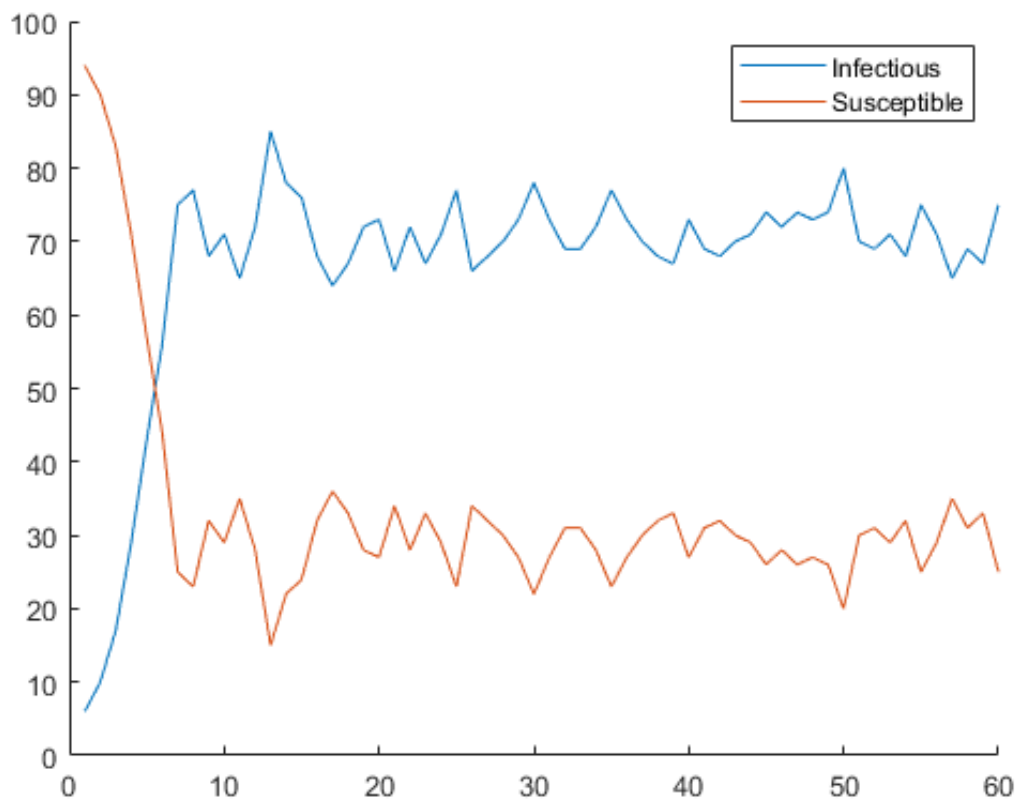
Filename:	'record.avi'
Path:	'C:\Users\ethan\OneDrive\Documents\University
FileFormat:	'avi'
Duration:	0.1

Video Properties:

ColorChannels:	3
Height:	343
Width:	434
FrameCount:	1
FrameRate:	10
VideoBitsPerPixel:	24
VideoFormat:	'RGB24'
VideoCompressionMethod:	'H.264'



```
plot(day_x,nI3, day_x,nS3)
legend('Infectious', 'Susceptible')
```



```
% For p = 0.6
[nS4 nI4 nR4] = epidemic(A, I, p2, rec_day, day, type);
```

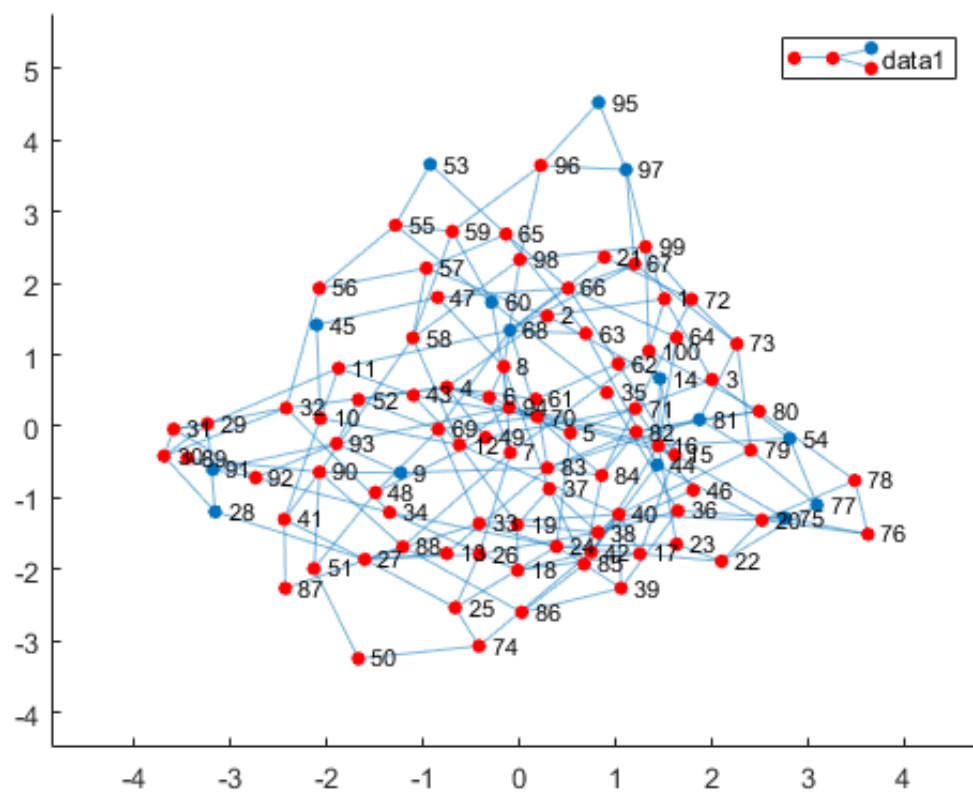
```
v =
VideoWriter
```

General Properties:

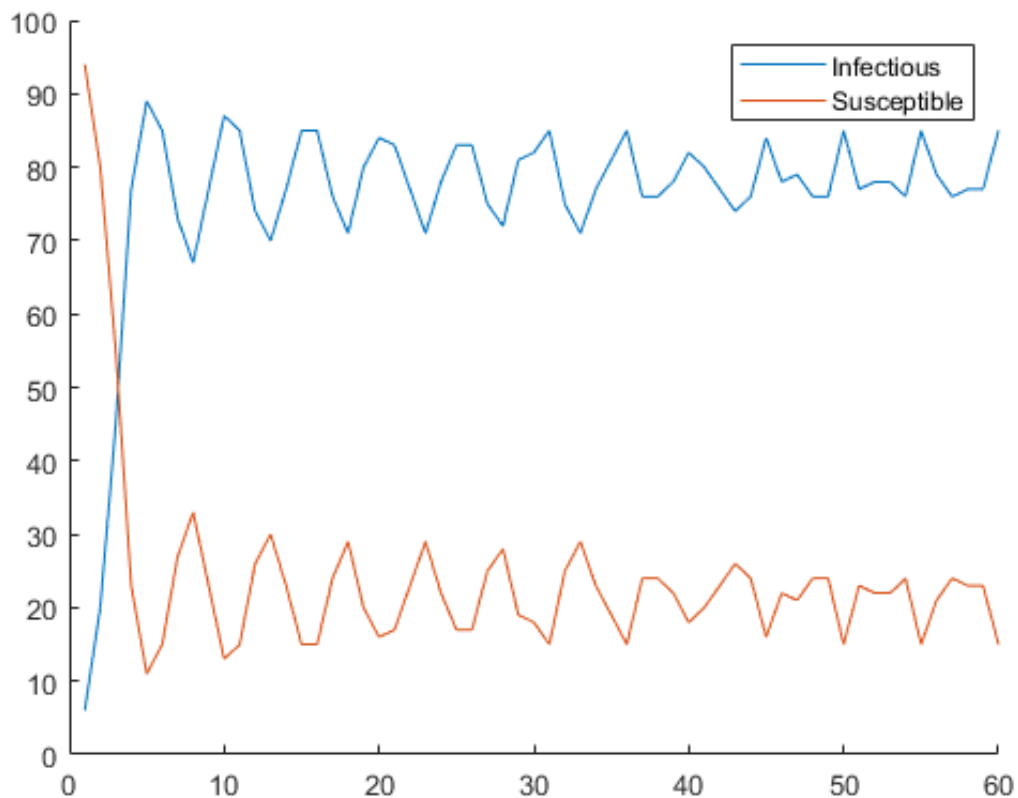
```
Filename:      'record.avi'
Path:          'C:\Users\ethan\OneDrive\Documents\University
FileFormat:    'avi'
Duration:      0
```

Video Properties:

```
ColorChannels: 3
Height:        []
Width:         []
FrameCount:    0
FrameRate:     10
VideoBitsPerPixel: 24
VideoFormat:   'RGB24'
```



```
plot(day_x,nI4, day_x,nS4)
legend('Infectious', 'Susceptible')
```



```
% In the instance where there is no Removed state for nodes, i.e. nodes can
% be reinfected after they recover, the  $p = 0.6$  scenario begins an
% oscillatory infectious and susceptible cycle. This is because the disease
% spreads very rapidly to the susceptible individuals so they all become
% infectious at similar times, therefore they all recover at roughly the
% same time. The cycle will continue in this oscillatory cycle. In contrast
% the  $p = 0.3$  scenario will maintain a fairly constant number of infectious
% and susceptible with smaller oscillations
```

```
%3d)
%trial and error p to make nI die out
p = 0.06
```

```
p = 0.0600
```

```
[nS5 nI5 nR5] = epidemic(A, I, p, rec_day, day, type);
```



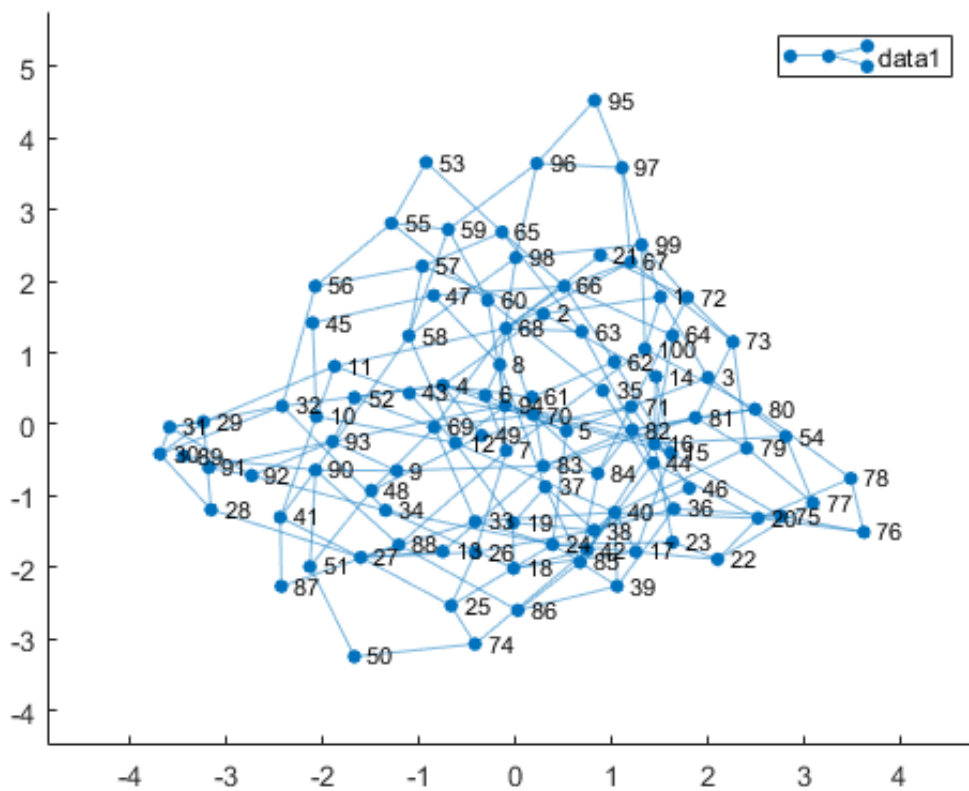
```
v =  
VideoWriter
```

General Properties:

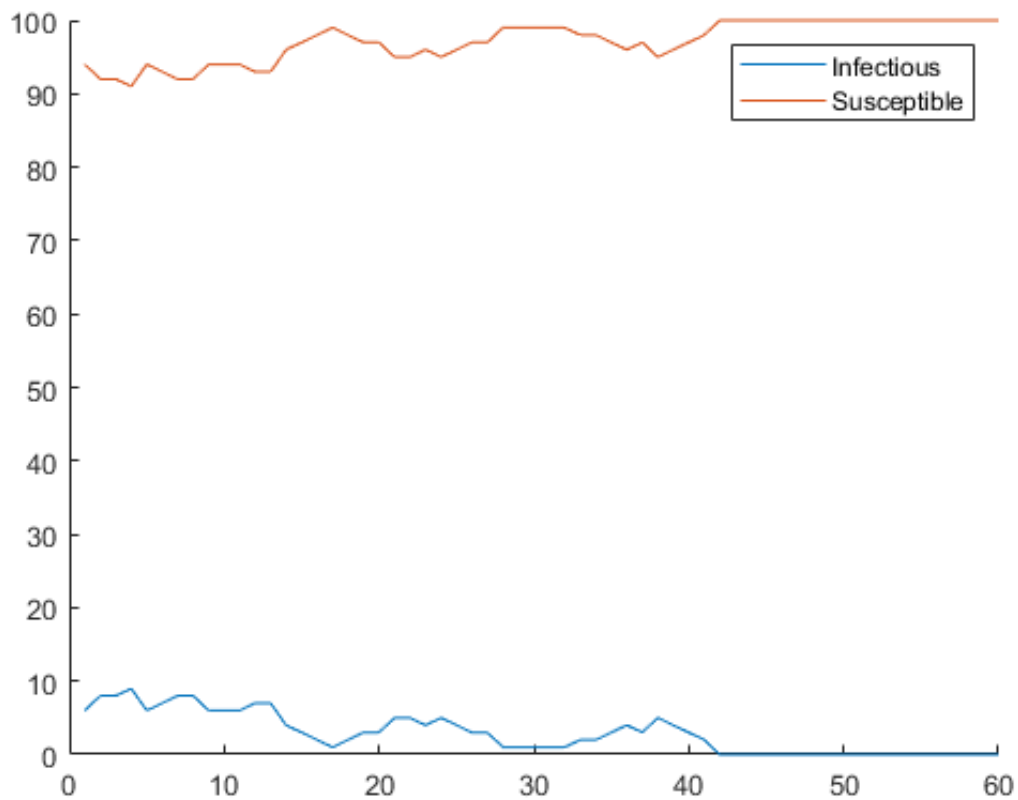
Filename:	'record.avi'
Path:	'C:\Users\ethan\OneDrive\Documents\University
FileFormat:	'avi'
Duration:	0.1

Video Properties:

ColorChannels:	3
Height:	343
Width:	434
FrameCount:	1
FrameRate:	10
VideoBitsPerPixel:	24
VideoFormat:	'RGB24'
VideoCodec:	'MPEG-4'
VideoProfile:	'Main'
VideoLevel:	'3550'



```
plot(day_x,nI5, day_x,nS5)  
legend('Infectious', 'Susceptible')
```



% value slightly greater than previous p for which disease does not die out
 $p = 0.09$

$p = 0.0900$

```
[nS6 nI6 nR6] = epidemic(A, I, p, rec_day, day, type);
```

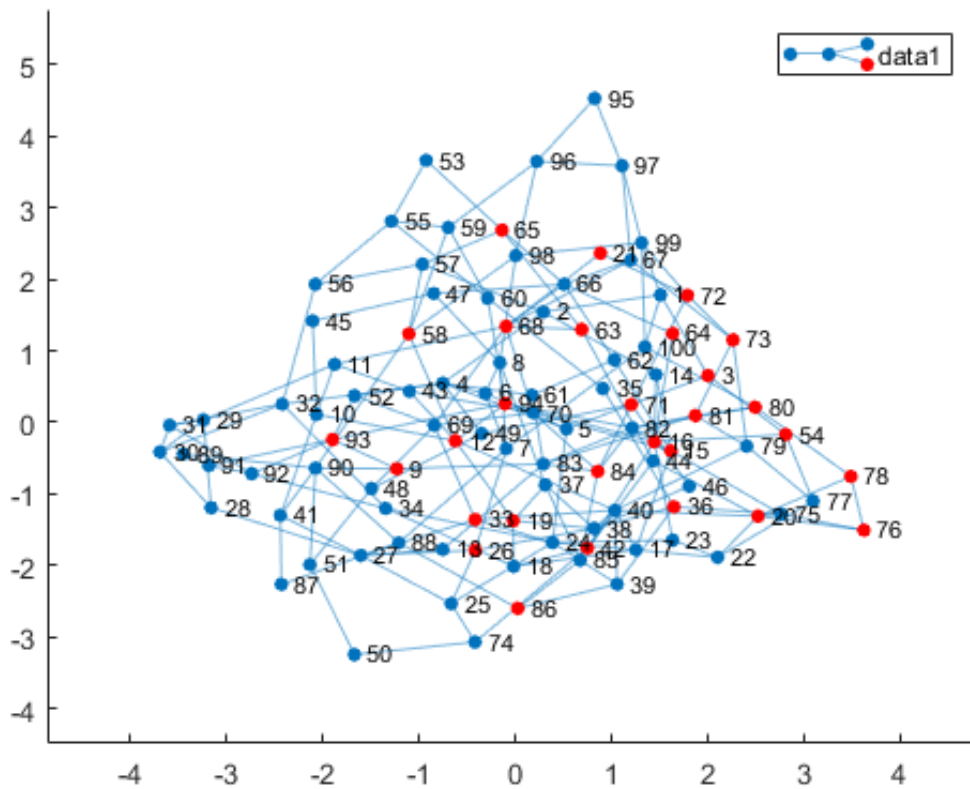
v =
 VideoWriter

General Properties:

Filename:	'record.avi'
Path:	'C:\Users\ethan\OneDrive\Documents\University'
FileFormat:	'avi'
Duration:	0

Video Properties:

ColorChannels:	3
Height:	[]
Width:	[]
FrameCount:	0
FrameRate:	10
VideoBitsPerPixel:	24
VideoFormat:	'RGB24'
VideoCompressionMethod:	'H.264'



```
plot(day_x,nI6, day_x,nS6)
legend('Infectious', 'Susceptible')
```

