Differential Equation Model.

Mass communication refers to newspapers, journals, radio and television.

Discrete Model:

$$y(i+1) - y(i) = dt*k*(20000 - y(i))$$

20000 = population size

y(i) = number who know some fact

20000 –y(i) = number who do NOT know

dt = time step

k = “advertising” proportionality constant.

Continuous Model:

$$y'(t) = k*(20000-y(t)).$$

Personal communication refers to discussions with other people.

Discrete Model:

$$y(i+1) - y(i) = dt*c*y(i)*(20000 - y(i))$$

$$k = c*y(i)$$

c = “gossip” proportionality constant.

Continuous Model:

$$y'(t) = c*y(t)*(20000-y(t)).$$

Method of Solution.

Use Matlab's ode45, which is an implementation of the Runge-Kutta 45 scheme with variable time steps.

Matlab Implementation.

Use the m-files ypinfo.m and info.m.

```
function ypinfo = ypinfo(t,y)
 ypinfo(1) = (.0001)*y(1)*
                (20000 -y(1));
```

```
%your name, your student number,
lesson number
clear;
yo = [1];
to = 0;
tf = 10;
[t y] = ode45('ypinfo',[to tf],yo);
plot(t,y)
title('your name, your student
number, lesson number')
xlabel( 'time')
ylabel( 'informed')
```

Find k and c by using the improved Euler method.

Suppose initially y(0) = 1, and after one day

y(1) =200.

For the mass communication model we can find k by

using y' = k(20000 -y) and the improved Euler method

200 - 1 = 1*k*(1/2)*((20000 - 1) +

(20000 - 200))

and k = .01.

For the personal communication model we find the c

by using the logistic differential equation

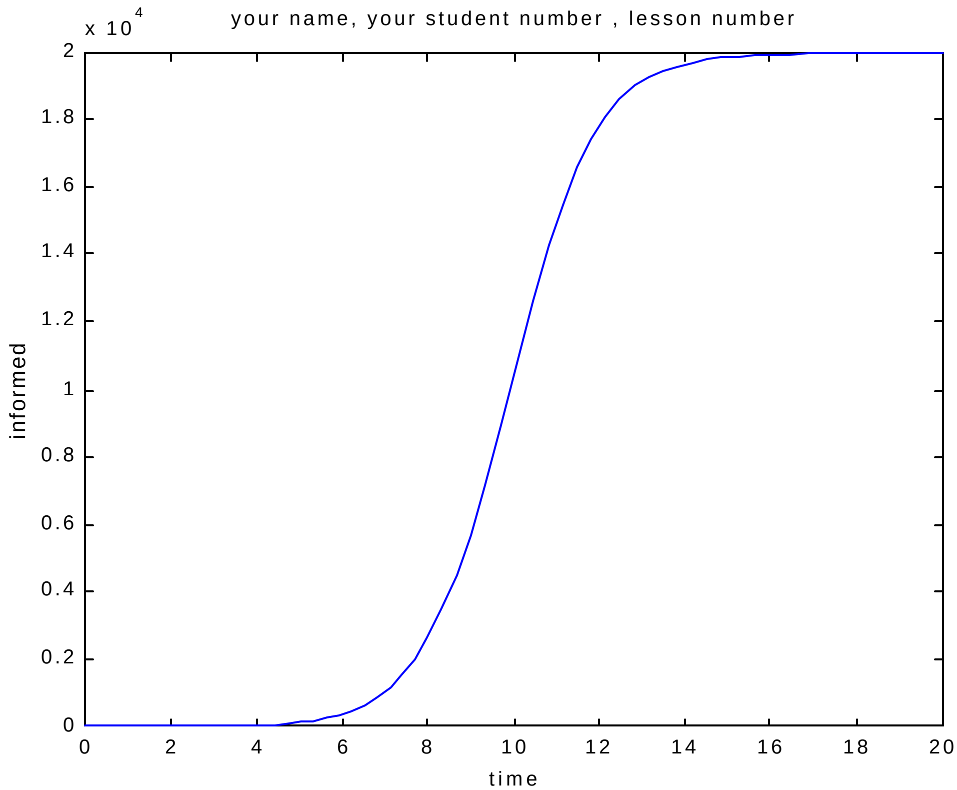
y' = cy(20000 -y) and the improved Euler method

200 - 1 = 1*c*(1/2)*(1*(20000 - 1)

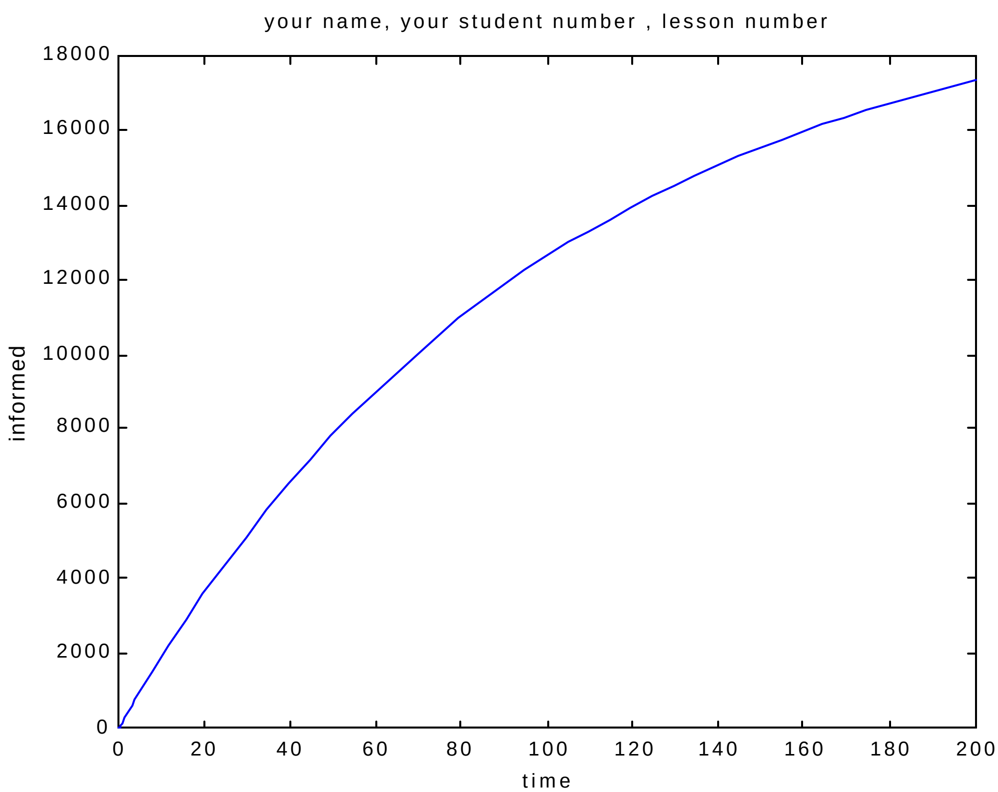
+ 200*(20000 - 200))

and c = .0001.

The solution for the mass communication model reaches the steady state solution much more slowly than the solution for the personnel communication model. This could explain why commercials try to be very “cute” or “interesting” so that people will talk about them.



your name, your student number , lesson number
x 10^4
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
informed
0 2 4 6 8 10 12 14 16 18 20
time



your name, your student number , lesson number
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
informed
0 20 40 60 80 100 120 140 160 180 200
time