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GEOS597 Homework #1: GIT, Markdown and MATLAB

Due: 9/02/2016

```
close all;
clear all;
clc;
```

Problem 1: Variables and time

A)

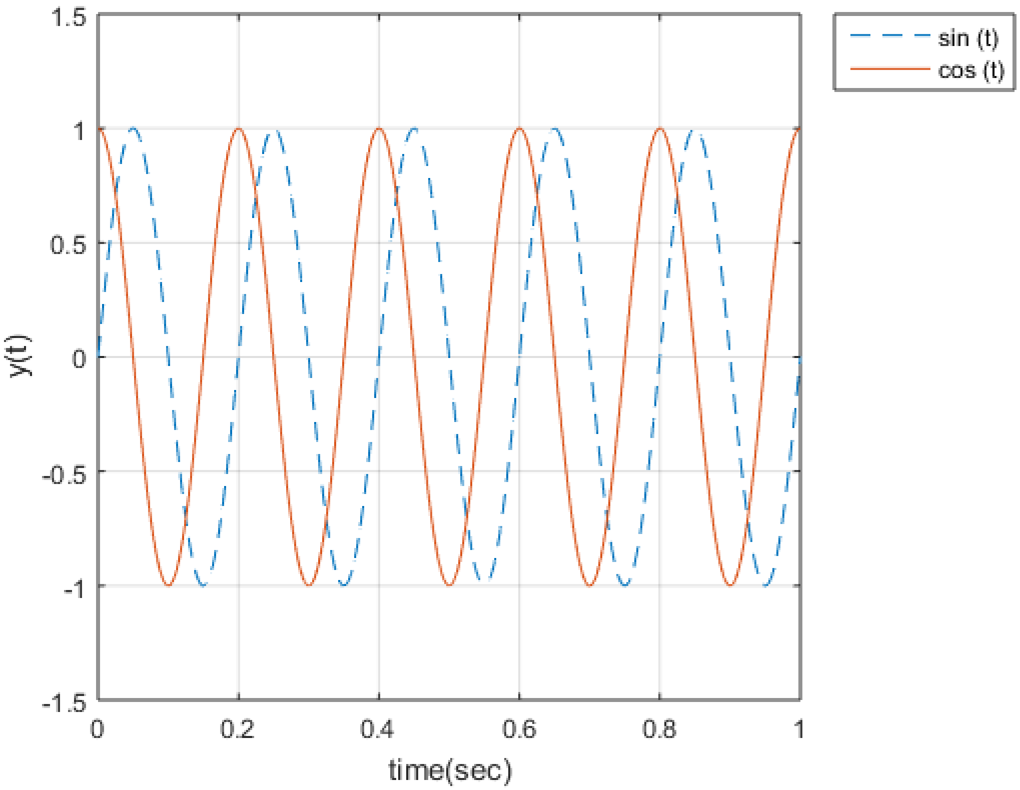
```
time = clock;
size (time);
%
% Time is a 1 x 6 row vector. Time contains, in order: year, month,
 date, hour,
% and minute data. Time is classified as a double variable.
%
% B)
yearString = datestr (time,'yyyy');
```

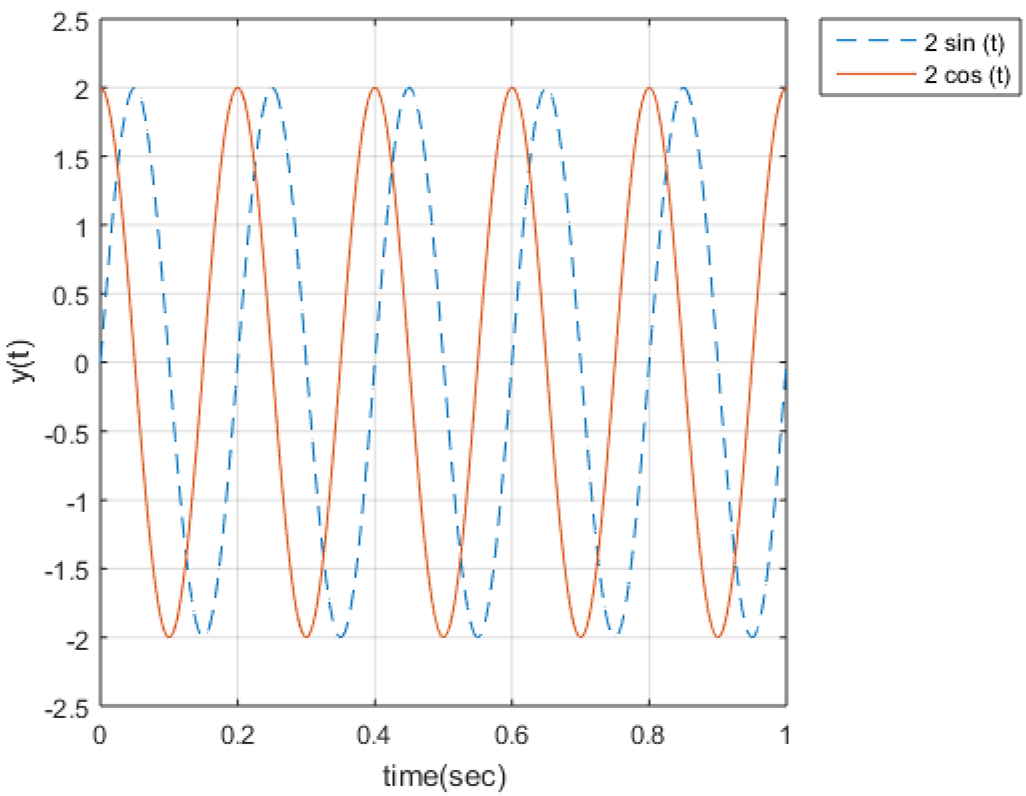
Problem 2: Plotting sine and cosine waves

A)

```
tArray=linspace(0,1,1001);
% The sample interval is 0.001 sec.
% B)
f = 5;          % [Hz]
% C)
w = 2*pi*f;     % angular frequency in [rad/sec]
% D)
sineArray = sin(w*tArray);
cosArray  = cos(w*tArray);
% E)
figure (1);
plot (tArray, sineArray,'--');
hold on;
plot (tArray, cosArray);
xlabel ('time(sec)');
ylabel ('y(t)');
% F)
```

```
legend('sin (t)','cos (t)','Location','northeastoutside');
% G)
axis ([0 1 -1.5 1.5]);
% H)
grid on
% I)
% It appears we successfully plotted 5 Hz sine and cosine waves, as
 each
% wave moves through 5 cycles over the course of 1 second. The sine
 and
% cosine waves are identical in shape, but out of phase by .05 sec.
%
% J)
% Wave amplitude = 1.
%
% K)
% We could change the amplitudes by multiplying our sine and cosine
 waves
% by some coefficient > 1 as shown below:
figure (2);
plot (tArray,2*sineArray,'--');
hold on;
plot (tArray, 2*cosArray);
xlabel ('time(sec)');
ylabel ('y(t)');
legend('2 sin (t)','2 cos (t)','Location','northeastoutside');
axis ([0 1 -2.5 2.5]);
grid on;
```


sin (t)
cos (t)
y(t)
time(sec)

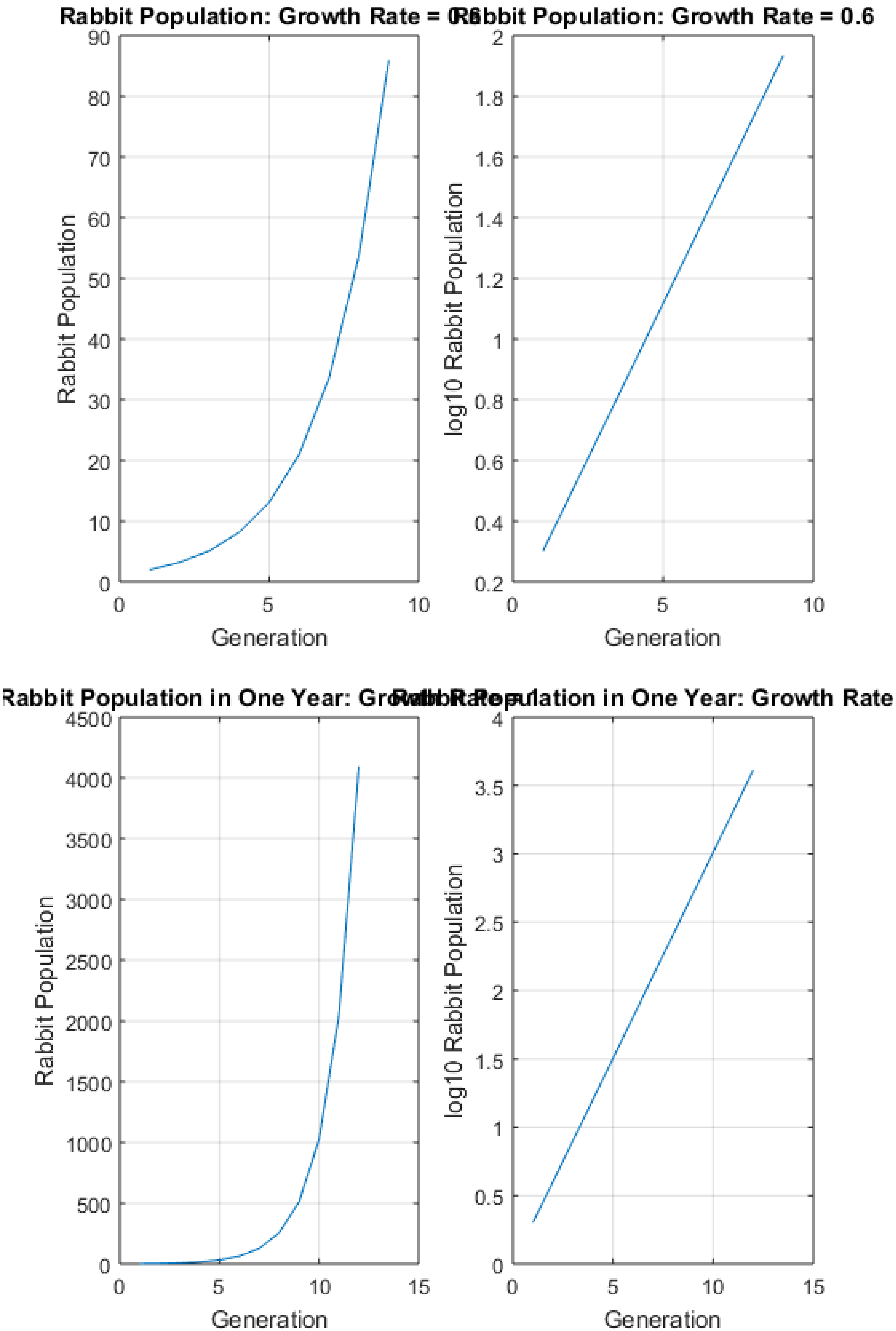

2 sin (t)
2 cos (t)
y(t)
time(sec)

Problem 3: Population growth

A)

```
initialRabbits = 2;
dt = 1;
% B)
maxGestation = 8;
growthRate = 0.6;

% C)
n = 1;
rabbitPopulation = zeros(2,9);
while n <= maxGestation;
    rabbitPopulation(1,n) = n;
    rabbitPopulation(2,1) = initialRabbits;
    rabbitPopulation(2,n+1) = rabbitPopulation(2,n) +
 growthRate*rabbitPopulation(2,n)*dt;
    n = n+1;
end

rabbitPopulation(1,9)=9;

% D)
figure (3);
subplot (1,2,1);
plot (rabbitPopulation(1,:),rabbitPopulation(2,:));
xlabel ('Generation')
ylabel ('Rabbit Population')
title ('Rabbit Population: Growth Rate = 0.6');
grid on;
hold on;
subplot (1,2,2);
plot (rabbitPopulation(1,:),log10(rabbitPopulation(2,:)));
xlabel ('Generation')
ylabel ('log10 Rabbit Population')
grid on;
title ('Rabbit Population: Growth Rate = 0.6');

% E)
%
% Varying the value of the growth rate from 0.1 to 0.9, varies the
 final
% rabbit population after eight generations from ~5 to ~350. Clearly
 the
% value of the growth rate has a strong influence on rabbit
 populations.
%
% F)
%
% According to the Merck Manual (2011), average rabbit gestation
 period is
```

```
% ~ 31 days. This means that there are between 11 - 12 gestation units
 per
% calender year. Running the model above with a growth rate of 1 and
 11
% gestation units per year, predicts a rabbit population of 4096.

maxGestation = 11;
growthRate = 1;

% C)
n = 1;
rabbitPopulation = zeros(2,12);
while n <= maxGestation;
    rabbitPopulation(1,n) = n;
    rabbitPopulation(2,1) = initialRabbits;
    rabbitPopulation(2,n+1) = rabbitPopulation(2,n) +
 growthRate*rabbitPopulation(2,n)*dt;
    n = n+1;
end

rabbitPopulation(1,12)=12;
figure (4);
subplot (1,2,1);
plot (rabbitPopulation(1,:),rabbitPopulation(2,:));
xlabel ('Generation')
ylabel ('Rabbit Population')
title ('Rabbit Population in One Year: Growth Rate = 1');
grid on;
hold on;
subplot (1,2,2);
plot (rabbitPopulation(1,:),log10(rabbitPopulation(2,:)));
xlabel ('Generation')
ylabel ('log10 Rabbit Population')
title ('Rabbit Population in One Year: Growth Rate = 1');
grid on;
```


Rabbit Population: Growth Rate = 0.6
Rabbit Population
Generation
log10 Rabbit Population
Generation
Rabbit Population in One Year: Growth Rate
Rabbit Population
Generation
log10 Rabbit Population
Generation

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