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Problem 1: Variables and time

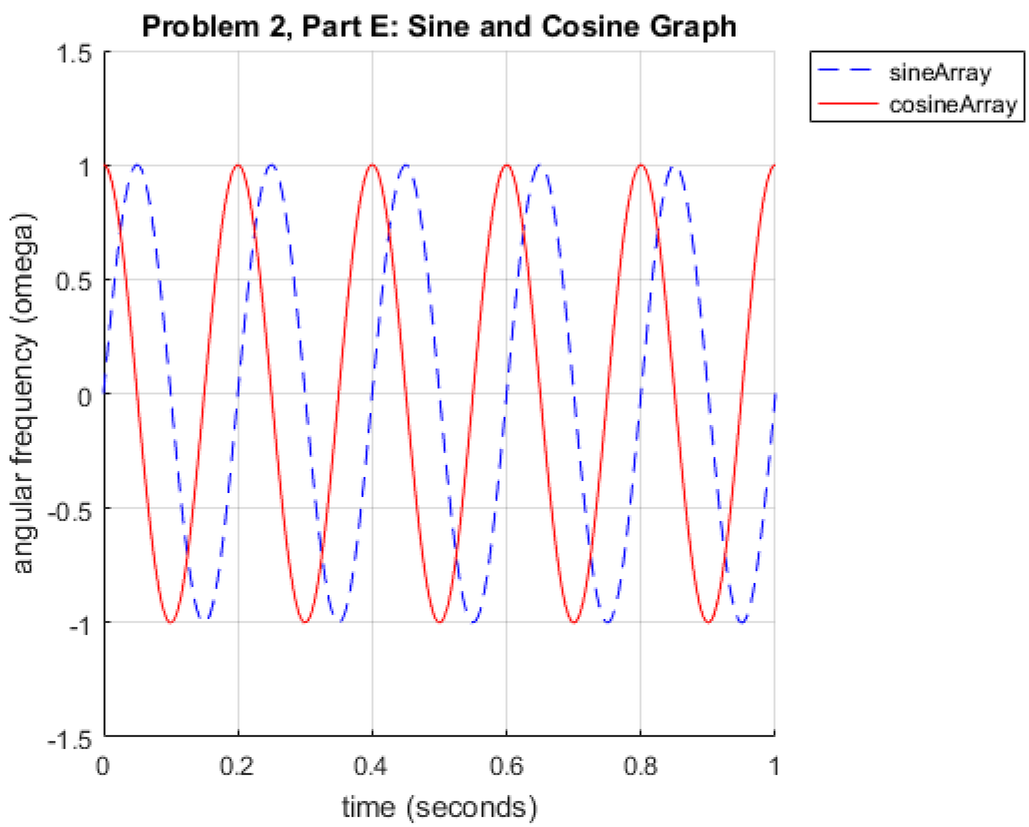
```
% A)
% time is of size [1,6], containing six elements.
% time is a row vector.
% time contains six elements (year month day hour minute seconds),
 seconds
%   are displayed with three decimal places of accuracy.
% time is a vector containing numeric (double) variables.

time = clock; % assigns variable time to clock function
size(time); % returns 1 6, therefore one row of six elements
isrow(time); % returns 1, therefore true

% B)

yearString = datestr(now,10); % returns string of current year

% C)

save HW2part1.mat % saves all variables to file
savefile = 'HW2part1specific.mat'; % creates variable for filename
save(savefile, 'time', 'yearString', '-mat') % saves filename with
 specified variables
```

Problem 2: Plotting sine and cosine waves

```
% A)

% The sample interval for tArray is (tMax - tMin)/(1000) seconds, or
 0.0010
% seconds.

tMin = 0; % starting variable
tMax = 1; % ending variable
tInterval = 1000; % interval per specifications
```

```
tArray = linspace(tMin, tMax, tInterval + 1); % creating array of 1001
 points between starting and ending variables, and including the end
 value (1)

% B)

f = 5/(tMax-tMin); %? tInterval % 5 Hz, or 5 cycles per second

% C)

% To convert from frequency to angular frequency, multiply by 2pi

omega = f *((2*pi)); % converting frequency (f) to angular frequency
 (omega)

% D)

sineArray = sin(omega*tArray); % computing sine values for array,
 units in radians

%sineArray =

cosineArray = cos(omega*tArray); % computing cosine values for array,
 units in radians

% E)

figure % creates new figure window
hold on % keeping axes same so both sine and cosine are on same graph
title('Problem 2, Part E: Sine and Cosine Graph') % title for chart
xlabel('time (seconds)') % x-axis label for chart
ylabel('angular frequency (omega)') % y-axis label for chart
plot(tArray, sineArray, '--b') % plotting sineArray with specified
 style
plot(tArray, cosineArray, '-r') % plotting cossineArray with specified
 style

% F)

legend(' sineArray',' cosineArray', 'Location', 'northeastOutside') %
 adding legend outside of plot, in figure window per specifications

% G)

axis([tMin tMax -1.5 1.5]); % setting axes values per specification

% H)

grid on; % turning on the grid for the plot

% I)

% I computed 5Hz sin and cos waves, evidenced by each having five
% oscillations occuring within one second. They are also similar in
```

```
% amplitude, but are out of phase with one-another as is expected with
 sine
% and cosine graphs.

% J)

% The amplitude of the waves is 1, for both sine and cosine.

% K)

% The amplitude of the waves could be changed by a factor in front of
 the
% sine or cosine function.
```

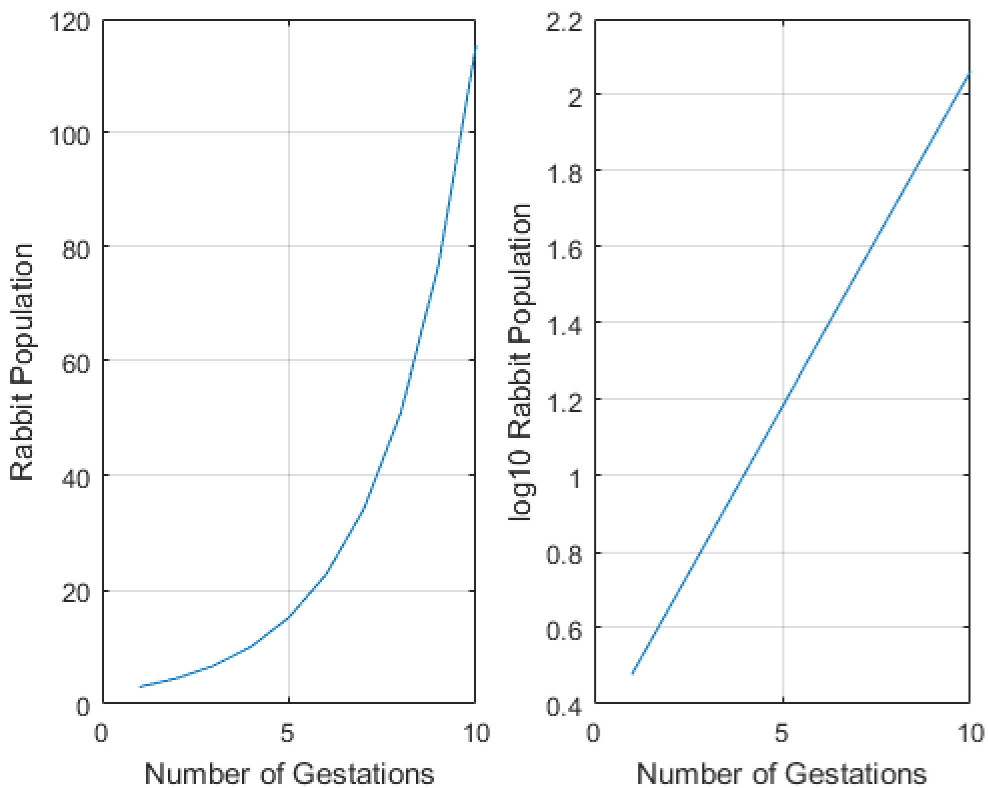


Problem 3: Population Growth

```
% A)

initialRabbits = 2; % initial population, per specifications
dt = 1; % gestation unit, per specifications

% B)

growthCycles = 10; % number of gestation units to run model for
growthRate = 0.5; % rate of growth, between 0 and 1 (inclusive)
```

```
% C)

populationArray = zeros(growthCycles, 2); % creates an empty array to
 fill
ii = 0; % index used for filling in array
jj = growthCycles; % index used for filling in array, to start at
 second column
numGenerations = 0; % index to track number of generation



while growthCycles > 0 % while loop,
    initialRabbits = initialRabbits +  (initialRabbits * growthRate *
 dt); % population growth formula, provided
    growthCycles = growthCycles - 1; % decrimenting growth cycles each
 iteration
    numGenerations = numGenerations + 1; % incrementing growth cycles
 each iteration
    ii = ii + 1; % incrementing index
    jj = jj + 1; % incrementing index
    populationArray(ii) = initialRabbits; % filling in indexed
 location with population value
    populationArray(jj) = numGenerations;  % filling in indexed
 location with generations value

end

% D)

figure (2) % creating new figure

subplot(1,2,1) % creating subplot of requisite size, position 1
plot(populationArray(:,2),populationArray(:,1)); % values to plot from
 array
grid on % turning on grid
xlabel('Number of Gestations') % x-axis label for chart
ylabel('Rabbit Population') % y-axis label for chart


subplot(1,2,2) % creating subplot of requisite size, position 2
plot(populationArray(:,2),log10(populationArray(:,1))); % values to
 plot from array with log10 modifier
grid on % turning on grid
xlabel('Number of Gestations') % x-axis label for chart
ylabel('log10 Rabbit Population') % y-axis label for chart

% E)

% The population change with various growth rates showed that the
 smaller
% the growth rate, the closer the curve was to a straight line
 (meaning a
% more steady population growth), while larger growth rates created an
% exponential curve (a population boom). Because of mathematical
```

```
% properties, the log10 curve remained straight independent of growth
 rate.

% F)

% The gestation period for rabbits is approximately 31 days
% (http://www.rabbit.org/fun/answer3.html, accessed 09/07/2016). There
% would be roughly 12 gestation periods in a year (365/31 = 11
 complete
% cycles). With an initial population of two rabbits, a growth rate of
 1,
% for 11 cycles in a calendar year, the end population would be 4096.
```



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