Homework 02 - Steve Mazza

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Problem 1

In wolframalpha.com: 38+(120-38)e^(-0.45*t) for t=0..3

```
close all
clc
clear all

% declare variables prior to use
Tf = 0;         % result
Tc = 38;        % temperature of the closed container
Ti = 120;       % temperature of the soda at t=0
k = 0.45;       % constant (given)
t = 3;          % duration of experiment

% output result to user
Tf = Tc + (Ti - Tc) * exp(-k * t);
fprintf(...
    '\nThe temperature of the soda after %d hours is %f degrees F.\n',...
    t, Tf);
```

```
The temperature of the soda after 3 hours is 59.257701 degrees F.
```

Problem 2

```
close all
clc
clear all

% user configurable variables.
DEBUG = 0;              % used for testing purposes
mat_max_value = 30;     % maximum value of the matrix
mat_dim = 5;            % size fo the matrix

% create 5x5 random square matrix with maximum value of 30
R = randi(mat_max_value, mat_dim);
if (DEBUG)
    disp(R)
end
```

```
% find and zero all elements > 20.
R(find(R > 20)) = 0;
if (DEBUG)
    disp(R)
end

% find and zero all remaining even numbers.
R(find(mod(R,2) == 0)) = 0;
if (DEBUG)
    disp(R)
end

% find the largest remaining element(s) and print their indices
% NOTE: my method fails to find multiple matching values, only returning
%       the first.
% Start by finding the latgest value of the matrix (converted to a vector).
[max_value, max_value_index] = max(R(:));
% Now convert the index to a row/column value pair.
[i,j] = ind2sub(size(R),max_value_index);
fprintf(...
    '\nThe largest value remaining in R (%d) is located at (%d,%d).\n',...
    max_value,i,j);
```

The largest value remaining in R (19) is located at (4,1).

Problem 3

```
close all
clc
clear all

% user configurable variables
t = 17;         % number of years
P = 5000;       % principal
r = 0.085;      % annual interest rate
n = 1;          % number of times per year interest is compounded

% First, calclate the balance of the 2nd account after 17 years.
B = P * (1+(r/n))^(n*t);
fprintf(...
    '\nThe balance of the 2nd account after %d years is: $%.2f\n',...
    t,B);

% Now change our compounding from yearly to monthly.
n = 12;

% Next we use the time value of money to find t given present and future
%       value.
t = (log(B/P))/(log(1+(r/n)))/12;

% Convert t from a decimal value to years/months.
```

```
years = fix(t);
months = ceil((t - years) * 12);

% Output result to user.
% NOTE: strcat() is used for output legibility.
fprintf(strcat('The balance of the 1st account will reach ', ...
    ' $%.2f in %d years and %d months.\n'), B,years,months);
```

```
The balance of the 2nd account after 17 years is: $20011.31
The balance of the 1st account will reach $20011.31 in 16 years and 5 mont
```

Problem 4

```
close all
clc
clear all

DEBUG = 0;              % used for testing purposes

% Create initial vector.
n = [1 10 100 500 1000 2000 4000 8000];
if (DEBUG)
    disp(n')
end

% Compute new vector using element-wise operations.
y = (1 + 1 ./ n).^n;
if (DEBUG)
    disp(y')
end

% Compute the difference vector.
e = exp(1);             % strictly for convenience
d = abs(y-e)/e*100;
if (DEBUG)
    disp(d')
end

% Build output matrix.
m = [n' y' d'];

% Output results to user.
fprintf('\n\n');
format shortg;
disp(m);
```

```
     1           2       26.424
    10       2.5937       4.5815
   100       2.7048      0.49546
   500       2.7156     0.099817
  1000       2.7169     0.049954
```

```
2000       2.7176     0.024989
4000       2.7179     0.012497
8000       2.7181    0.0062493
```

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