Table of Contents

Header

```
% Name: Logan Calder
% Lab Number: 1
% Class: ECEN 50L
% Date: 4/9/24
% Section time: 14:15T
```

PART 1

```
% Equation Creation

disp((3.7*4+3*5+2.3*3)/(4+5+3)); % Displaying the equation to console
```

```
    3.0583
```

PART 2

```
% Cosine of a value in even steps

a=pi*0.1*[0:19];
disp(cos(a)); % Displays the cos of a in even steps of 0.1pi * i, where i is
0:19.
```

```
  Columns 1 through 7

    1.0000    0.9511    0.8090    0.5878    0.3090    0.0000   -0.3090

  Columns 8 through 14

   -0.5878   -0.8090   -0.9511   -1.0000   -0.9511   -0.8090   -0.5878

  Columns 15 through 20

   -0.3090   -0.0000    0.3090    0.5878    0.8090    0.9511
```

PART 3

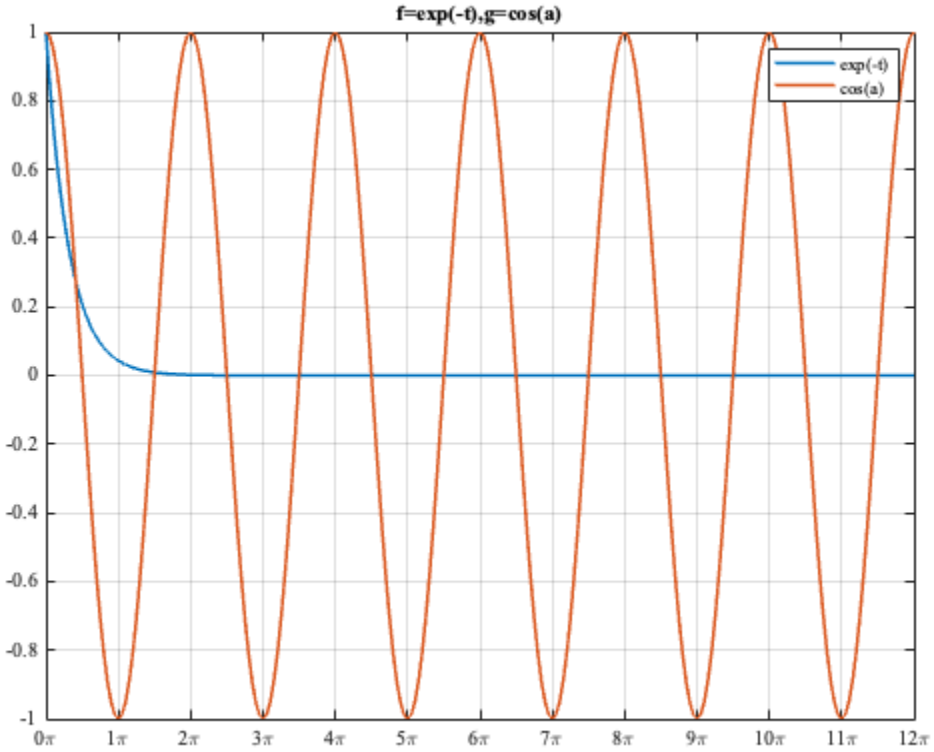
```
% Creating Plot


% Below is equation and varaible declaration

t=[0:0.01:100]; % This is the range for t var
a = pi * [0:0.05:12]; % Range for a var
plot (t, exp(-t), a, cos(a), linewidth=1.5); %% Plotting each var w/
respective equations

% The bellow is plot formatting

xlim([0,12*pi]);
title('f=exp(-t),g=cos(a)');
xticks(pi*[0:1:12]);
Labels = string([0:1:12]) + "\pi";
xticklabels(Labels);
legend("exp(-t)" , "cos(a)");
set(findall(gca, '-Property', 'FontName'), 'FontName', 'Times New Roman');
grid on;
```



PART 4

```
clear all;
close all;

% Equation Creation
syms x;
f = (exp(-3*x) + 10*sin(x+1)) / (cos(x+1));
g = (exp(-2*x) / (1+(exp(-2*x))));
h = -4*x^2;

% Differentiation

Df1 = diff(f,x);
Df2 = diff(g,x);

pretty(Df1);
pretty(Df2);

% Integration

If1 = int(h,x, [-2,2]);

pretty(If1);
```

```
10 cos(x + 1) - exp(-3 x) 3   sin(x + 1) (exp(-3 x) + 10 sin(x + 1))
--------------------------- + -------------------------------------
         cos(x + 1)                                      2
                                                cos(x + 1)

   exp(-4 x) 2      exp(-2 x) 2
---------------- - -------------
                2   exp(-2 x) + 1
(exp(-2 x) + 1)

  64
- --
   3
```

PART 5

```
A = [ 2,1; 3,2];
B = [ 3,1; 2,2];

% Transposes

disp(A');
disp(B');

% Matmul

A1 = A * B;
```

```
A2 = B * A;
A3 = (A'* B')';
A4 = (B' * A')';

disp(A1); % Same as A4
disp(A2); % Same as A3
disp(A3);
disp(A4);

A5 = inv (A * B);
A6 = inv(A) * inv(B);
A7 = inv (B * A);
A8 = inv(B) * inv(A);

% Inverses

% We may see that the below matrices being multiplied are inverses as they
% produce the identity matrix.

disp(A1*A5);
disp(A3*A6);
disp(A2*A7);
disp(A4*A8);

% Matrix Multiplications
% The below matrix multiplications produce the same results.

disp(A1*(A*B));
disp((A*B)*A1);
```

```
     2     3
     1     2

     3     2
     1     2

     8     4
    13     7

     9     5
    10     6

     9     5
    10     6

     8     4
    13     7

    1.0000   -0.0000
    0.0000    1.0000

     1     0
     0     1
```

```
    1.0000    0.0000
    0.0000    1.0000

    1.0000         0
   -0.0000    1.0000

   116    60
   195   101

   116    60
   195   101
```

PART 6

```
% Matrix Declarations
C = [ 1,0,1; 3,3,4; 2,2,3];
S = [10;12;5];

% Inverting C
Ci = inv(C)

% Calculating Answer
V = Ci*S

% Double Checking Work

C*V % This gives us S, verifying the work


Ci =

    1.0000    2.0000   -3.0000
   -1.0000    1.0000   -1.0000
         0   -2.0000    3.0000


V =

   19.0000
   -3.0000
   -9.0000


ans =

   10.0000
   12.0000
    5.0000
```

PART 7

```
% Clearing

clear all;
close all;

% Entering Variables for Known Variables

% Voltages
Vs = 12;

% Current
Is1 = 4e-3;
Is2 = 2e-3;

% Resistance
R1 = 1e3;
R2 = R1;
R3 = R1;
R4 = R1;
R5 = R1;
R6 = R1;

% Define Unknown Symbolic Variables

syms Va Vb Vc Vd;

% Equations

eq1 = -Is1 + (Va-Vb)/R1 + (Vd-Vc)/R2 + Vd/R5 + Vd/(R3+R6) == 0;
eq2 = (Vb-Va)/R1 + Is2 + Vc/R4 + (Vc-Vd)/R2 == 0;
eq3 = Vc - Vb == Vs;
eq4 = Vd - Va == 2*Vc;

% Enter Equations & Variables
eqns = [eq1, eq2, eq3, eq4];
vars = [Va, Vb, Vc, Vd];

% Turning Equations to Matrix

[C, S] = equationsToMatrix(eqns, vars);


% Solving For V

V = inv(C) * S;
pretty(C);
pretty(S);
pretty(V)
```

```
/   1       1      1     1   \
|  ----,  - ----, - ----,   ---  |
```

```
|  1000     1000    1000    400  |
|                                |
|     1      1       1        1  |
| - ----,  ----,    ---,  - ---- |
|   1000   1000     500     1000 |
|                                |
|    0,     -1,      1,      0   |
|                                |
\   -1,      0,     -2,      1   /

/   1   \
|  ---  |
|  250  |
|       |
|    1  |
| - --- |
|   500 |
|       |
|   12  |
|       |
\   0   /

/  -4 \
|     |
| -10 |
|     |
|  2  |
|     |
\  0  /
```

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