LAB 2 - Bo Chang, Lin - MAT 275

Exercise 1

```
A=[-2 8 -9;-5 -8 -8;4 -4 3];
B=[-5 3 9;-10 1 0;20 2 -2];
b=[3 -2 14]';
c=[2 0 1];
d=[1 4 1]';
```

Part (a)

```
disp(A*B)
```

```
  -250   -16     0
   -55   -39   -29
    80    14    30
```

```
disp(B*A)
```

```
    31  -100    48
    15   -88    82
   -58   152  -202
```

```
disp(c*A)
```

```
     0    12   -15
```

```
disp(B*d)
```

```
    16
    -6
    26
```

Part (b)

```
C=[A;B]
```

```
C = 6×3
    -2     8    -9
    -5    -8    -8
     4    -4     3
    -5     3     9
   -10     1     0
    20     2    -2
```

```
D=[B d]
```

```
D = 3×4
    -5     3     9     1
   -10     1     0     4
    20     2    -2     1
```

Part (c)

```
syms x y z
disp(A*[x y z]' == b)
```

$$\begin{pmatrix} 8\,\overline{y} - 2\,\overline{x} - 9\,\overline{z} = 3 \\ -5\,\overline{x} - 8\,\overline{y} - 8\,\overline{z} = -2 \\ 4\,\overline{x} - 4\,\overline{y} + 3\,\overline{z} = 14 \end{pmatrix}$$

```
disp([x y z]' == inv(A)*b)                                              %
Method 1
```

$$\begin{pmatrix} \overline{x} = \frac{524}{123} \\ \overline{y} = -\frac{295}{492} \\ \overline{z} = -\frac{223}{123} \end{pmatrix}$$

```
format rational
disp(A\b)                                                               %
Method 2
```

```
     524/123
    -295/492
    -223/123
```

```
format default
disp(A\b)
```

```
    4.2602
   -0.5996
   -1.8130
```

Part (d)

```
A(1,1)=0;
disp(A)
```

```
     0     8    -9
    -5    -8    -8
     4    -4     3
```

Part (e)

```
a=A(2,:)
```

```
a = 1×3
    -5    -8    -8
```

Part (f)

```
B(:,1)=[]
```

```
B = 3×2
     3     9
     1     0
     2    -2
```

Exercise 2

Part (a)

Display contents of geomsum1 M-file

```
type 'Lab2_Ex2_geomsum1' % here I renamed it for file sorting purpuse
```

```
function S = Lab2_Ex2_geomsum1(commRatio,a_1st,n_term)

S=0;

for i = 0:1:n_term-1
    S = S + a_1st*commRatio^i;
end
```

Assign values to input variables

```
r = -7/9;
a = 3;
n = 12;
```

Compute geometric sum for specified values of r,a, and n.

```
format default
S1 = Lab2_Ex2_geomsum1(r,a,n)
```

```
S1 = 1.6048
```

Part (b)

```
type 'Lab2_Ex2_geomsum2'
```

```
function Lab2_Ex2_geomsum2(r,a,n)

sum(a*ones(1,n).*(r.^[0:n-1]))

end
```

```
Lab2_Ex2_geomsum2(r,a,n)
```

```
ans = 1.6048
```

Exercise 3

Part (a)

Initiate product P.

```
P = 1;
```

Define starting iteration index.

```
m = 1;
```

Define stepsize of iteration.

```
k = 2;
```

Define ending iteration index.

```
n = 1+2*8;
```

Compute product.

```
for i = m:k:n
    P=P*i;    % muliply P by next element at each iteration (suppress output)
end
```

Display product.

```
disp(P)
```

```
    34459425
```

Part (b)

```
P = prod(1:2:17) % Single command
```

```
P = 34459425
```

Exercise 4

Initiate variables.

```
power = 3;
k = 1;                % initiate counter
```

Initialize the vector v to the empty vector

```
v = [];
```

Compute powers and store in v.

```
while power < 10^5    % specify condition of while-loop: stop iterating once
                      % condition is no longer satisfied
    v(k) = power;     % evaluate kth entry of the vector  v
    k = k + 1;        % increment counter k
    power = 3^k;      % compute next value of power at each iteration
end
```

Display vector v.

```
disp(v)
```

```
           3           9          27          81         243         729        2187        6561       196
```

```
disp(v')
```

```
           3
           9
          27
          81
         243
         729
        2187
        6561
       19683
       59049
```

```
3^size(v,2) < 10^5 & 10^5 < 3^(size(v,2)+1)     % Check result
```

```
ans = logical

   1
```

Exercise 5

Display contents of function f M-file.

```
type 'Lab2_Ex5_f.m'      % here I renamed it for file sorting purpuse
```

```
function y = Lab2_Ex5_f(x)

if x <= 5
    y = 2-x;
elseif (5 < x) && (x <= 10)
    y = exp(x-13);
elseif x == 13
    y = "the function is undefined at x = 13";
else
    y = x./(x-13);
end

end
```

Evaluate f at the given vaue of x.

```
 Lab2_Ex5_f(4)
```

```
ans = -2
```

Evaluate f at the given value of x.

```
Lab2_Ex5_f(5)
```

```
ans = -3
```

% Evaluate f at the given value of x.

```
Lab2_Ex5_f(5.5)
```

```
ans = 5.5308e-04
```

Evaluate f at the given value of x.

```
Lab2_Ex5_f(10)
```

```
ans = 0.0498
```

Evaluate f at the given value of x.

```
Lab2_Ex5_f(13)
```

```
ans =
"the function is undefined at x = 13"
```

Evaluate f at the given value of x.

```
Lab2_Ex5_f(14)
```

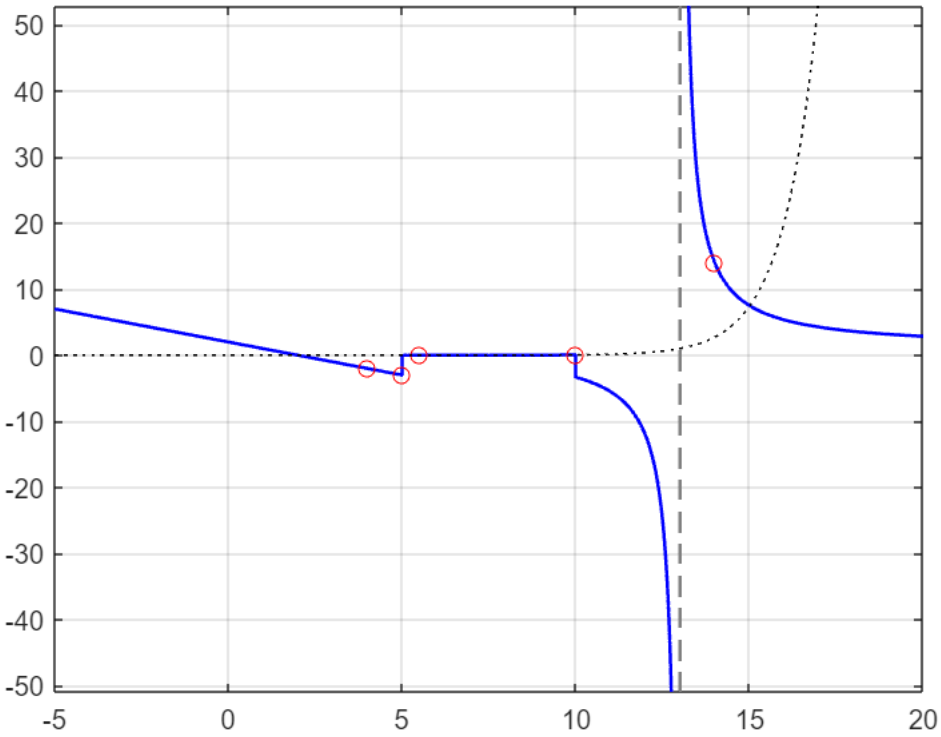
```
ans = 14
```

```
% Supplementary figure
syms x
y = piecewise(x <= 5,2-x,5 < x <= 10,exp(x-13),x > 10 & x~=13,x./(x-13));
fplot(y,[-5 20],"b","LineWidth",1.25)
grid on
hold on

for i = [4 5 5.5 10 14]
    plot(i,Lab2_Ex5_f(i),"ro")
end

fplot(exp(x-13),"k:")
% fplot(x./(x-13),"y-.")

hold off
```


50
40
30
20
10
0
-10
-20
-30
-40
-50
-5
0
5
10
15
20