Ministry of Higher Education and Scientific Research
BADJI MOKHTAR-ANNABA UNIVERSITY, Faculty of Technology, Department of Computer Science –
"Programming Tools for Mathematics" Exam - Duration: 1 hour 30 minutes

Exercise 1 (4 pts): Give the mathematical expressions equivalent to the following MATLAB instructions: w=−2∗log(5∗x)+sqrt((4∗x ^ 3)+3*i) ; y=abs(2∗n^5−3)/sqrt(4∗n^2+log(6∗n)) ; z=exp (sqrt(x))/(2∗y−1)+abs(x)−1 /(y ^ 2+3) ; t=sum((n:−1:1)./(1:n)).

Correction:

$w \leftarrow -2\ln(5x)+\sqrt{4x^3+3i}$, 1pt

$y \leftarrow |2n^5-3|/\sqrt{4n^2+\ln(6n)}$, 1pt

$z \leftarrow e\sqrt{x}/(2y-1)+|x|-1/(y^2+3)$, 1pt

$t=n+(n-1)/2+(n-2)/3+\cdots+1/n$. 1pt

Exercise 2 (4 pts): Consider the following function with two nested loops:

```
function M=calculate(M)
[n,m]=size(M);
for i=1:n
v=M(i,:);
for j=1:m
M(i,j)=v(m-j+1)
end
end
```

1. Give the value of B after executing the following instructions:
   >> A=[1 2 3 4;5 6 7 8;9 10 11 12];
   >> B=calculate(A)
2. Deduce what this function does.
3. Rewrite the calculate function to obtain the same result (without using loops).

Correction :

1. 1pt

B=

4 3 2 1
8 7 6 5
12 11 10 9

2. Renversement des lignes de la matrice 1pt

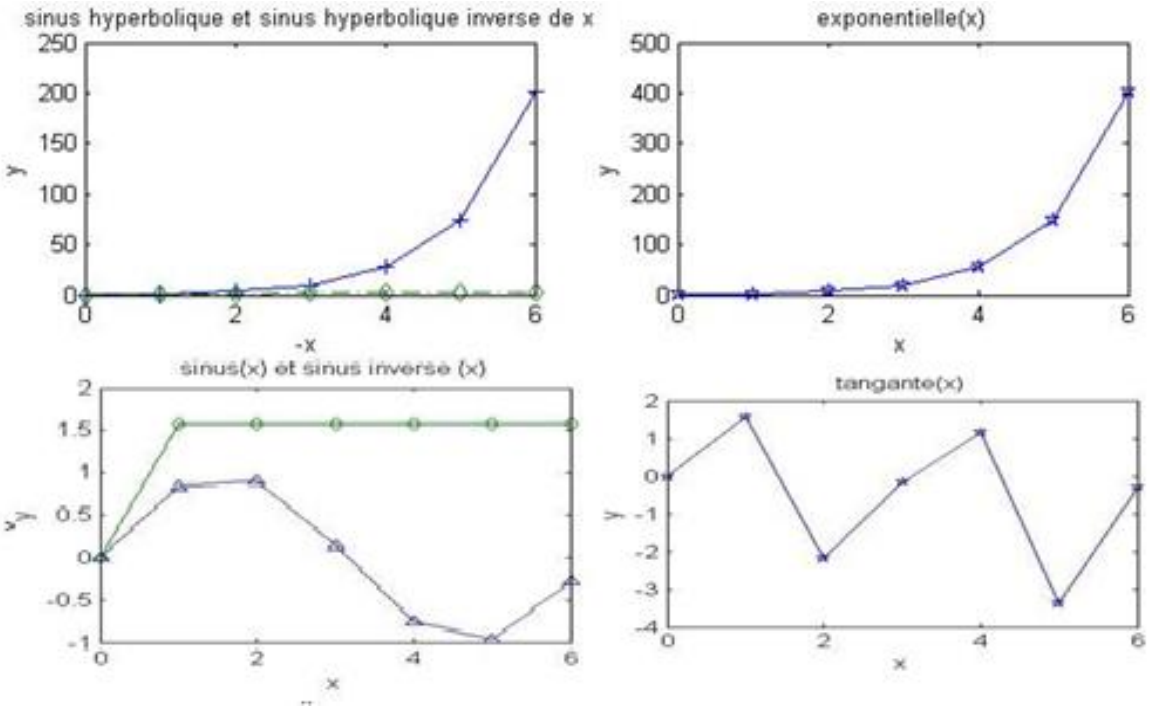
3. 2pt

```
function M=calcul1(M)
m=size(M,2);
N=M;
j=1:m
M(:,j)=N(:,m-j+1)
end
```

Ou

```
function M=calcul1(M)
M=fliplr(M)
end
```

Exercise 3 (8 pts): Write all the MATLAB instructions to plot the following curves:



Correction:

x=[0:1:6]; 0.5pt

f=sinh(x); 0.25pt
g=asinh(x); 0.25pt
subplot(2,2,1), plot(x, f,'+-',x, g,'-.d'), xlabel('-x'), ylabel('y'), title('sinus hyperbolique et sinus hyperbolique inverse de x') 2pt

z3=exp(x); 0.25pt
subplot(2,2,2), plot(x,z3,'-p'),xlabel('x'), ylabel('y'),title('exponentielle(x)') 1pt

z1=sin(x); 0.25pt
z2=asin(x); 0.25pt
subplot(2,2,3), plot(x,z1,'-^',x,z2,'-d'), xlabel('x'), ylabel('y'),title('sinus(x) et sinus inverse (x)') 2pt

y=tan(x); 0.25pt
subplot(2,2,4), plot(x,y,'p-'),xlabel('x'), ylabel('y'),title('tangante(x)') 1pt

Exercise 4 (4pts): write a Matlab script that allows you to calculate and display the approximate values of π for each integer n∈ [1 M].

$$\frac{1}{1^2\times 3^2}+\frac{1}{3^2\times 5^2}+\frac{1}{5^2\times 7^2}+\ldots+\frac{1}{n^2\times(n+2)^2}=\frac{\pi^2-8}{16}$$

Correction :

Function p= pn(n) 0.5 pt

S =0 ; 0.5 pt

For i=1 :2 :n **0.5pt**

S=s+1/(i^2*(i+2)^2) ; **0.5 pt**

End

P=sqrt(16*s+8) ; **0.5pt**

End

Script : ……

Clear ;

N=input(‘ donner un entier positif’) ; **0.5pt**

For i=1 :n **0.5 pt**

Vp(i)= pn(i); **0.5 pt**

End

vp