Session 1: solutions/comments for selected questions

Question 1

Comment: it is important to know the correct syntax of calling these basic built-in functions for computation of math/CS problems.

Question 2

	MATLAB syntax	Displayed answers
i	sin(3.14)	0.0016
ii	sin(3.14159)	2.6536e-06
iii	cos(pi/3) or cosd(60)	0.5000
iv	5*log(3)	5.4931
v	10^100	1.0000e+100
vi	10^(-7)	1.0000e-07
vii	((1+i)/(1-i))^3	0.0000 - 1.0000i
viii	log2(32)+log10(0.0001)	1
ix	abs(exp(1)-2*pi)	3.5649
x	1/exp(2) or exp(-2)	0.1353
xi	log(81)/log(3)	4.0000
xii	(sqrt(5)-1)/2	0.6180

Question 3

	MATLAB syntax	Displayed answers
i	x=0.35; y=(x^3-5*x+2)/(x^4+3)	y = 0.0971
ii	r=10; V=4/3*pi*r^3	V = 4.1888e+03
iii	a=2.1;b=5.3;c=sqrt(a^2+b^2)	c = 5.7009

Question 4

	MATLAB syntax
i	ones(5,2)
ii	zeros(3,6)
iii	ones(10,1)
iv	eye(4)
v	rand(5,3)
vi	randi([1,100],1,8)

Question 5

(b)

Valid matrix products: x*A, x*C, A*y

Invalid matrix products: x*B, A*x, B*x, C*x, y*A

(d)

Size of F is (3,3), a 3-by-3 matrix.

The result of det(F) indicates the determinate of F is 0. Mathematically, the inverse matrix of F does not exist. In you also compute inv(F), MATLAB will give you a warning saying that F is a singular matrix.

Question 6

Example:

A=[2,3,0;1,-4,2;0,3,5]

b=[0;19;14]

inv(A)*b

You should be able to interpret the answer as x=3, y=-2, z=4.

(i) x=2.0714, y=-0.6032,z=-0.2381

(ii)

A=[1,3,5;2,0,-3;1,-2,0]

b=[8;-4;3]

inv(A)*b

Final answer is x=1, y=-1, z=2.

Question 1

3162510 different ways. To compute it, in MATLAB command window, type

format long

factorial(54)/(factorial(5)*factorial(49))

Comment: the first line is to change the number of decimal digits in the displayed answer. You can change it back to the default setting, by calling **format short** (only 4 decimal places displayed) after this question.

Question 2

	MATLAB syntax
i	v1 = 5:5:200
ii	v2 = -10:**0.2**:10 or v2 = linspace(-10,10,**101**)
iii	v3 = (3:3:99)**'**

Question 3

The distance is 3.0241.

a = [3,19,8,-36]

b = [4,-5,7]

d = abs(dot(a(1:3),b)+a(4))/sqrt(a(1)^2+a(2)^2+a(3)^2)

Comment: you can use your own ways for the computation.

Question 4

Comment: this question provides examples of how to select sub-matrix by using the matrix indices.

Question 5

Comment: this question shows the concatenation of large matrix by joining small matrices, given that the sizes are well matched.

Question 6

Comment: Practice with matrix algebra operations, and the element-wise operations.

Question 7

(a)

	MATLAB syntax
i	roots([1,-2,-3])
ii	roots([-6,77,-271,187,-35])
iii	roots([1,0,0,-1])
iv	roots([2,0,-4,0])

Comment: this is a powerful command for finding all complex roots of polynomial functions.

(b)

(i) conv([5,0,-2,0],[3,4,-9])

You will have the result 15 20 -51 -8 18 0, which represent the product polynomial function

$$15x^5 + 20x^4 - 51x^3 - 8x^2 + 18x$$

(ii) $144x^7 - 74x^6 + 278x^5 - 244x^4 + 24x^3 + 106x^2 - 108x + 30$

a = [8,-5], b = [2,0,4,-2], c = [9,1,0,3]

conv(conv(a,b),c)

Comment: you can see how easily these computations can be performed by using vector representation of polynomials. That is one of the reasons we learn many polynomial approximation methods in the math class.