Name	
Signature	

General instructions: You may not ask questions during the test. If you believe that there is something wrong with a question, write down what you think the question is trying to ask and answer that.

Question	Points	Score
1	5	
2	5	
3	5	
4	5	
5	5	
6	5	
7	5	
8	5	
9	5	
10	5	
11	5	
12	5	
13	5	
14	5	
15	5	
16	5	
17	5	
18	5	
19	5	
20	5	
Total	100	

1. Which statement creates a pseudo-random 3D array with integer values ranging from 1-10?

   (a) `myArray = randi(10,2,5,3)`
   (b) `myArray = rand(3,2,5)`
   (c) `myArray = randi(10,2,5)`
   (d) `myArray = rand(10,2,5,4)`
   (e) `myArray = randi(10,3)`

2. Given `myArray = [ 10, 20, 30, 40, 50; 60 70 80 90 100 ]`, match the statement in the left column with the result in the right column.

`size(myArray)`		5
`length(myArray)`		2
`numel(myArray)`		[2, 5]
`ndims(myArray)`		10

3. Consider the following code:

```
myArray = [ 1, 0, 3; -2, -4, 1 ];
myArray2 = repmat(myArray,1,2);
myArray3 = repmat(myArray,2,1);
myArray2 = reshape(myArray2,4,3);
```

   Which statement is true after all the above code has executed?

   (a) `myArray3` has two rows and one column.
   (b) `myArray2` is a 2×6 array.
   (c) `myArray2` and `myArray3` are equal.
   (d) The call to `reshape` will generate an error because `myArray2` does not have the right number of elements.
   (e) `myArray2` and `myArray3` have the same elements but in a different order.

4. What is the value of `result` after the following code executes?

```
myArray = [ 2 5 1; 3 5 5 ];
myArray2 = [ 5 5 3; 3 1 5 ];
result = find(myArray - myArray2 == 0);
```

   (a) `[ -3 0 -2; 0 4 0 ]`
   (b) `[ 0 1 0; 1 0 1 ]`
   (c) `[ 1 0 1; 0 1 0 ]`
   (d) `[ 2 3 6 ]'`
   (e) `[ 2 4 6 ]'`

5. For each statement about `sort` and `sortrows`, indicate whether the statement is true or false.

(T/F) `sort` will sort the columns of a 2D array independently of each other.

(T/F) Given the array `names = char('Frank','Kate','Jane');`, the command `sortrows(names)` will alphabetize the names.

(T/F) Given the code `[sortedArray, sortedIndices] = sort(array);` for some numeric array `array`, the statement `all(sortedArray == array(sortedIndices))` will evaluate to true.

(T/F) Given `array = [ 8 10 7 1 9 ]; [sortedArray, sortedIndices] = sort(array);`, the value of `sortedIndices` is `[ 4 3 1 5 2 ]`.

6. Let

```
A = [ 1 2; 3 4 ];
B = [ 5 6; 1 3 ];
```

Fill in the results of the following operations.

`A * B` =	
`A .* B` =	
`A.^2` =	
`B'` =	

7. Given the system of equations,

$$5x + 4y + 3z = 7$$
$$x - 3y + z = -1$$
$$2x - z = 0,$$

write a few lines of Matlab code in the space below to solve the system for x, y, and z.

4

8. What is the value of `myVal` after the following code executes?

```
myVal = 5;
if( myVal <= 1 )
    myVal = myVal + 1;
elseif( myVal <= 3 )
    myVal = 2 * myVal;
elseif( myVal <= 7 )
    myVal = myVal - 1;
elseif( myVal <= 10 )
    myVal = myVal + 5;
else
    myVal = 0;
end
myVal = myVal * 2;
```

   (a) 4

   (b) 8

   (c) 2

   (d) 20

   (e) 0

9. Consider the code

```
num = 2;
while( num < 10 )
    num = 2 * num;
end
```

   For each statement, indicate whether the statement is true or false.
   (T/F) The value of `num` after the code executes is 8.
   (T/F) The loop body executes 3 times.
   (T/F) The code results in an infinite loop.
   (T/F) In this particular case, the result will be the same if we check `num` $\sim$= 10 instead of `num` < 10.

10. Consider the code

```
count = 1;
sum = 0;
while ( count <= 3 )
    for i = 1:count
        sum = sum + i;
    end
    count = count + 1;
end
```

The value of **sum** after the code executes is

(a) 1

(b) 3

(c) 6

(d) 10

(e) None of the above.

11. Consider the following three blocks of code which result in the same value for **arryOfSqrs**. Write the number 1 by the block of code that you expect to be the fastest, 2 by the next fastest, and 3 by the slowest. Explain why you would expect this result.

```
n = 10^5;
arryOfSqrs = 1:n;
arryOfSqrs = arryOfSqrs.^2;
```

```
n = 10^5;
arryOfSqrs = [];
for i = 1:n
  arryOfSqrs = [arryOfSqrs, i^2];
end
```

```
n = 10^5;
arryOfSqrs = zeros(1, n);
for i = 1:n
  arryOfSqrs(i) = i^2;
end
```

12. For each statement about scope of variables, indicate whether the statement is true or false.
    (T/F) A local function shares a workspace with the other functions in the same file.
    (T/F) A nested function shares a workspace with its parent function.
    (T/F) The main workspace (associated with the command line) can access variables defined inside functions if they are declared to be persistent.
    (T/F) A function workspace can access a variable defined in the main workspace if it is declared to be global.

13. Answer the following questions about functions in Matlab.

    (a) Assign `fHandle` to be a handle to the function `sin`.

        fHandle =

    (b) Write down a Matlab expression creating an anonymous function that takes two variables and returns their sum.

    (c) Given the name of a function stored in a variable `myFunction` of type `char`, how would you call that function and pass it the argument five?

14. Consider the recursive function

```
function result = Fibonacci(n)
  if ( n == 0 )
      result = 0;
      return;
  elseif ( n == 1 )
      result = 1;
      return;
  end
  result = Fibonacci(n-1) + Fibonacci(n-2);
end
```

Given the function call `Fibonacci(5)`, how many *additional* calls to the function `Fibonacci` will be made?

    (a) 0
    (b) 2
    (c) 10
    (d) 14
    (e) None of the above.

15. Consider the function

```
function result = MyFunction(x,y,z)
  switch ( nargin )
    case 1
      y = 1;
      z = 2;
    case 2
      z = 2;
  end
  result = x * y * z;
end
```

Which statement regarding this code is <u>false</u>?

(a) The caller can pass in arguments `x` and `y` and omit `z`.

(b) The caller can pass in arguments `x` and omit `y` and `z`.

(c) The caller can pass in arguments `x` and `z` and omit `y`.

(d) `MyFunction(1,2)` will return 4.

(e) `MyFunction(1)` will return 2.

16. Let `myArray` be a 3D array. Indicate whether each statement below is true or false.
(T/F) `myArray(:,:,1)` returns all the elements in the first layer of `myArray`.
(T/F) `size(myArray) == 3`.
(T/F) `ndims(myArray) == 3`.
(T/F) `myArray(1:2:end,1:2:end,1:2:end)` has half the number of elements as `myArray`.

17. A Matlab RGB image

(a) must have type `uint18`.

(b) must have type `double`.

(c) is a 3D array of size $m \times n \times 3$.

(d) uses a colormap to determine how the image will be displayed.

(e) can have any numeric type.

18. Which statement regarding Matlab indexed images is <u>false</u>?

(a) The colormap array can have as many rows and columns as the user desires.

(b) An indexed image consists of a 2D image array and a 2D colormap array.

(c) User-defined colormaps can be used.

(d) The colormap array contains red, green, and blue color information.

(e) Indexed images can be displayed with either `image` or `imagesc`.
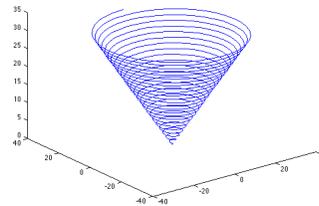
19. Match the Matlab command with the resulting plot.

```
t = linspace(0,10*pi,1000);
x = t.*sin(5*t);
y = t.*cos(5*t);
z = t;
plot3(x,y,z)
```
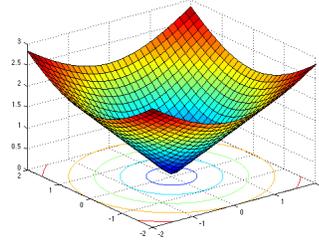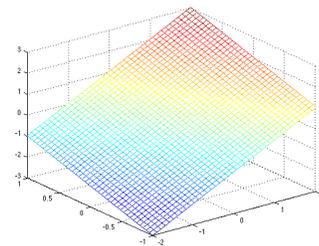


```
xRow = linspace(-2, 2, 40);
yRow = linspace(-1, 1, 40);
[x, y] = meshgrid(xRow,yRow);
z1 = x + y;
mesh(x, y, z1);
```
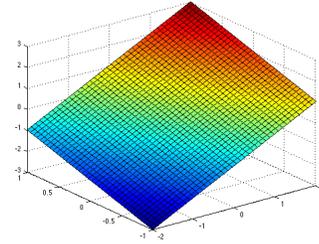


```
xRow = linspace(-2, 2, 40);
yRow = linspace(-1, 1, 40);
[x, y] = meshgrid(xRow,yRow);
z1 = x + y;
surf(x, y, z1);
```



```
xRow = linspace(-2, 2, 30);
yRow = linspace(-2, 2, 30);
[x, y] = meshgrid(xRow,yRow);
z1 = sqrt( x.^2 + y.^2 );
surfc(x, y, z1);
```


20. Indicate whether each statement about cell arrays and structure arrays is true or false.
    (T/F) Cell arrays can be indexed with either cell or content indexing.
    (T/F) Cell arrays can mix a variety of data types unlike regular arrays.
    (T/F) Structure arrays cannot mix data of different types.
    (T/F) A structure stores data in named fields unlike a cell array.