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.
<table>
<thead>
<tr>
<th>Question</th>
<th>Points</th>
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<tbody>
<tr>
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<td>4</td>
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</tr>
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<td>Total</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
1. Which statement assigns the value 3200 to the variable myNum and suppresses the output from the command window?
   (a) myNum == 3200
   (b) myNum = 3000 + 200
   (c) myNum == 3200;
   (d) myNum = 3.2e3; ⇐
   (e) myNum = 3.2e2;

2. What are the values of apples and oranges after the following code executes?

   apples = 5;
   oranges = apples - 1;
   oranges = oranges + apples;
   apples = apples - 1;

   (a) apples = 4, oranges = 9 ⇐
   (b) apples = 5, oranges = 9
   (c) apples = 4, oranges = 8
   (d) apples = 5, oranges = 8
   (e) apples = 5, oranges = 4

3. Indicate whether each statement is true or false.
   (T/F) A double precision number’s range is about 1000 times greater than a single precision number’s range.
   (T/F) Following the assignment myNum = 5, the variable myNum will be of type int16.
   (T/F) Floating point numbers can represent larger numbers than unsigned integers.
   (T/F) Due to rounding error, it is not necessarily true that (a + b) + c = a + (b + c) for some floating points values a, b, c.
   (T/F) eps(number) will give the absolute error associated with representing that number in floating point.
   (T/F) Computing 1/0 will yield the value Inf.
   (T/F) Computing Inf - 0 with yeild the value NaN.

4. Using the precedence rules for arithmetic operators, determine which statement is true.

   (a) 1 / 3 * 3 == 1 / 9
   (b) 2 ^ 2 * 2 == 16
   (c) 2 + 2 * 3 == 12
   (d) 10 / 5 + 2 == 4 ⇐
   (e) 2 - 3 * 2 == -2
5. Consider the function definition,

```matlab
function [ apples, oranges ] = MyFunction( pears )
    apples = pears * 2;
    oranges = apples - 1;
end
```

and the following code that calls this function:

```matlab
apples = 1;
oranges = 3;
pears = 4;
[ oranges, pears ] = MyFunction( apples );
```

What will be the value of `apples`, `oranges`, and `pears` after the code executes?

(a) apples = 1, oranges = 0, and pears = 1
(b) apples = 2, oranges = 2, and pears = 4
(c) apples = 2, oranges = 3, and pears = 1
(d) apples = 6, oranges = 2, and pears = 4
(e) apples = 1, oranges = 2, and pears = 1

6. Which statement regarding functions and scripts is true?

(a) By default, variables defined in a script will not be visible in the main workspace.
(b) By default, variables defined in a function will not be visible in the main workspace. ⇐
(c) Functions can be called with multiple inputs but return only a single output.
(d) Like functions, scripts are terminated with the `end` keyword.
(e) Scripts can be called with input arguments.

7. Which statement regarding 1D arrays is true?

(a) `myArray = [ 1, 2, 3, 4 ];` creates a row array of size 4 \times 1.
(b) `myArray = [ 1, 2, 3, 4 ]';` creates a column array of size 1 \times 4.
(c) `myArray = [ 3:-1:0 ];` creates a row array of size 1 \times 4. ⇐
(d) `myArray = [ 1:2:4 ];` creates a row array of size 1 \times 3.
(e) `myArray = [ 1:7 ]';` `myArray(6) = [];` results in an array of size 5 \times 1.

8. For each `fprintf` statement in the left column, draw a line to the corresponding output in the right column.

```
fprintf('---%4.2f---', 2.718281828459046)  ---2.72--
fprintf('---%5.2f---', 2.718281828459046)  -- 2.72--
fprintf('---%4.3e---', 2.718281828459046)  --2.718e+00--
fprintf('---%4.0f---', 2.718281828459046)  --  3--
```
9. Consider the following code:

```matlab
myArray = [ 1:10 ];
isEvenNumber = mod(myArray,2) == 0;
evenNumbersArray = myArray(isEvenNumber);
```

Indicate whether each statement is true or false.

(T/F) `evenNumbersArray` has length 5.
(T/F) `isEvenNumber` has length 5.
(T/F) `isEvenNumber` is of class `logical`.
(T/F) `myArray` is of class `int32`.
(T/F) Matlab evaluates the command `isEvenNumber = mod(myArray,2) == 0;` the same as `isEvenNumber = (mod(myArray,2) == 0);`.

10. Consider the following code:

```matlab
apples = 3;
oranges = 2;
pears = 1;
```

Indicate whether each statement is true or false.

(T/F) `apples <= oranges`
(T/F) `~(apples ~= oranges+1)`
(T/F) `(apples > oranges) & (pears < 2)`
(T/F) `(apples < oranges) | ~(pears < 2)`
(T/F) `(pears & apples) < pears`

11. Consider two floating point numbers, `x` and `y`, whose values lie between 1 and 10. Which of the following is the best way to test for equality of `x` and `y`?

(a) `x == y`
(b) `abs(x-y) < 1`
(c) `abs(x-y) < .01` ⇐
(d) `x-y < .001`
(e) `abs(x+y) < .0001`
12. Fill in the following truth tables.

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>and(X,xor(X,Y))</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
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<tr>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>not(X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
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<tr>
<td>0</td>
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<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>or((X &amp; Y),(~X &amp; ~Y))</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
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<tr>
<td>0</td>
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<td>1</td>
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<td>1</td>
</tr>
</tbody>
</table>

13. For each expression below, use the space provided to write the value of the expression or **error** if the expression is not valid Matlab code.

<table>
<thead>
<tr>
<th>Expression</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>![not([ 0, 1, 1, 0 ])]</td>
<td>![1, 0, 0, 1]</td>
</tr>
<tr>
<td>![ [ 0, 1, 0 ] &amp; [ 1, 0 ]]</td>
<td><strong>error</strong></td>
</tr>
<tr>
<td>![ [ 0, 1, 0 ]</td>
<td>1 ]</td>
</tr>
<tr>
<td>![ [ 0, 1, 0 ] &amp; 0 ]</td>
<td>![0, 0, 0]</td>
</tr>
</tbody>
</table>

14. Given the array `myArray = [-1, 2, 0, 4, -5 ]`, which statement sets all of the positive elements of `myArray` to 1?

(a) `myArray = (myArray > 0) .* myArray + (myArray < 0)`
(b) `myArray = (myArray ~= 0) .* myArray + (myArray > 0)`
(c) `myArray(myArray<0) = myArray & 0`
(d) `myArray = (myArray <= 0) .* myArray + (myArray > 0) <=`
(e) `myArray = (myArray >= 0) .* myArray + (myArray < 0)`
15. For each block of code in the left column, draw a line to the corresponding figure in the right column.

```matlab
figure;
x = [0:.05:2*pi];
y = sin(x);
z = cos(x);
subplot(1,2,1)
plot(x,y,'-k');
subplot(1,2,2)
plot(x,z,'-.k');
```

```matlab
figure;
x = [0:.05:2*pi];
y = sin(x);
z = cos(x);
hold on
plot(x,y,'-k');
plot(x,z,'-.k');
```

```matlab
figure;
x = [0:.05:2*pi];
y = sin(x);
z = cos(x);
plot(x,y,'-k');
plot(x,z,'-.k');
```

```matlab
figure;
x = [0:1:2*pi];
y = sin(x);
z = cos(x);
plot(x,y,'-k');
plot(x,z,'-.k');
```

```matlab
figure;
x = [0:1:2*pi];
y = sin(x);
z = cos(x);
hold on
plot(x,y,'-k');
plot(x,z,'-.k');
```
16. Consider the following code.

```matlab
x = [ 1, 2, 3, 4 ];
y = 7;
z = 1;
save('MyFile','y','z');
```

Which statement is true?

(a) All of the variables in the workspace are saved to a file *MyFile.mat*.
(b) `load('MyFile')` loads only the value of `x` into the workspace.
(c) `load('MyFile','x','y','z')` loads the values of `x`, `y`, `z` into the workspace.
(d) `load('MyFile','z')` loads the values of `y` and `z` into the workspace.
(e) `load('MyFile','y')` loads only the value of `y` into the workspace.

17. Indicate whether each statement is true or false.

(T/F) `myName = 'Jane'; myName(4) = 'e'` results in `myName == 'Janee'`.
(T/F) The command `uint8('abc')` will display the ASCII code for the letters A, B, and C.
(T/F) `char('Hello','my','name','is','Jane')` will concatenate the input strings into one string.
(T/F) The code `any('Jane' == 'jane')` generates true.
(T/F) The code `all(upper('Jane') == 'JANE')` generates true.

18. Match the statement in the left column with the resulting value in the right column.

| myArray = [ 1, 4, 3, 4; 5, 6, 7, 8 ] | [1 4 3 4; 5 6 7 8] |
| myArray = [ 1, 4, 3, 4; 5, 6, 7, 8]' | [1 5 4 6 3 7 4 8] |
| myArray = [ [1, 2]; [4, 5, 6] ] | error |
| myArray = [ 1, 2, 3, 4; 5, 6, 7, 8 ] myArray(2,1) = 4 | [1 2 3 4; 4 6 7 8] |

19. Regarding 2D arrays, indicate whether each statement is true or false.

(T/F) Row-column indexing uses two numbers to index the array while linear indexing uses one number.
(T/F) If the linear index of element `(m,n)` is `k`, then the linear index of element `(m+1,n)` is `k+1`.
(T/F) If the linear index of element `(m,n)` is `k`, then the linear index of element `(m+1,n+1)` is `k+2`.
(T/F) If the linear index of element `(m,n)` is `k`, then the linear index of element `(m,n+1)` is `k+1`. 
20. Let

\[ \text{myArray} = [1, 2, 3; 4, 5, 6] \]

Which statement is false?

(a) \( \text{myArray}(:,3)=[] \) deletes the third column of \( \text{myArray} \).
(b) \( \text{myArray}(1:2,3:4) \) gives an error.
(c) \( \text{myArray}([1, 2, 1],3) \) gives an error. ⇐
(d) \( \text{myArray}([2:-1:1],1) \) is the subarray \( [4, 1]' \).
(e) \( \text{myArray}(:) \) gives a \( 6 \times 1 \) array.

21. Let

\[ \text{myArray} = [10, 20, 30, 40; 50, 60, 70, 80; 90, 100, 110, 120] \]

Which statement is true?

(a) \( \text{myArray} = \text{myArray}(:) \) does not change the shape of \( \text{myArray} \).
(b) \( \text{myArray} = \text{reshape}(\text{myArray},4,3) \) does not change the shape of \( \text{myArray} \).
(c) \( \text{myArray} = \text{reshape}(\text{myArray},2,2) \) changes the shape of \( \text{myArray} \) to \( 2 \times 2 \).
(d) The statement \( \text{myArray}(:,:) = \text{myArray}(:,) + [1:12]' \) changes the shape of \( \text{myArray} \).
(e) The statement \( \text{myArray}(:,:) = \text{myArray}(:,) + [1:12]' \) changes the values in \( \text{myArray} \) but leaves the shape the same. ⇐

22. Given \( \text{myArray} = [10, 20, 30, 40; 50, 60, 70, 80; 90, 100, 110, 120] \), match the statement in the left column with the result in the right column.

| \( \text{size(}\text{myArray}\text{)} \) | [2, 5] |
| \( \text{length(}\text{myArray}\text{)} \) | 5 |
| \( \text{numel(}\text{myArray}\text{)} \) | 10 |
| \( \text{ndims(}\text{myArray}\text{)} \) | 2 |
23. Which statement about sort and sortrows is false

(a) sort will sort the columns of a 2D array independently of each other.
(b) sortrows will sort the columns of a 2D array independently of each other. ⇐
(c) Given the array names = char(‘Frank’, ‘Kate’, ‘Jane’);, the command sortrows(names) will alphabetize the names.
(d) Given the code [sortedArray, sortedIndices] = sort(array); for some numeric array array, the statement all(sortedArray == array(sortedIndices)) will evaluate to true.
(e) Given array = [ 8 10 7 1 9 ]; [sortedArray, sortedIndices] = sort(array);, the value of sortedIndices is [ 4 3 1 5 2 ].

24. Let

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

Fill in the results of the following operations.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>A * B</td>
<td>[ 7 12; 19 30 ]</td>
</tr>
<tr>
<td>A .* B</td>
<td>[ 5 12; 3 12 ]</td>
</tr>
<tr>
<td>A.^2</td>
<td>[ 1 4; 9 16 ]</td>
</tr>
<tr>
<td>B'</td>
<td>[ 5 1; 6 3 ]</td>
</tr>
</tbody>
</table>

25. 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 \(z\).

A = [ 5 4 3 ; 1 -3 1 ; 2 0 -1 ];
b = [ 7 -1 0 ]';
solution = A \ b;