1. Consider the following code.

```plaintext
x = [2 3 4];
y = {1,x,3};
A = {y,2};
```

Which of these would return the values in x?

(a) A(1)(2)
(b) A(1){2}
(c) A{1}{2}
(d) A{1}(2)
(e) None of the above

2. Consider the following code:

```plaintext
x = (0 || 1) && ~(1 && 0);
y = 0 || 0;
z = y || ~x;
w = ~z && ~y;
```

Which of the following are true?

(a) z and w
(b) y and z
(c) x and w
(d) All of the above
(e) None of the above
3. What is the value of result when executing the following code?

```plaintext
array = [10, 1, NaN, -2]
if array(1) > 2
    output = 3;
else if array(2) < 0
    result = 0;
else if array(3) == NaN
    result = 1;
else if array(4) > 0
    result = 2;
end
```

(a) result = 3
(b) result = 0
(c) result = 1
(d) result = 2
(e) result is not defined

4. After executing the following piece of code in the command line, what value does `ans` have?

```plaintext
'bob' == 'bub';
```

(a) 0
(b) 1
(c) 0 0 0
(d) 0 1 0
(e) 1 0 1

5. You run the following code:

```plaintext
name.first = 'Oski';
name.last = 'Bear';
name.year = 2018;
class(name(1).first)
```

and the result you obtain is:

(a) logical
(b) double
(c) struct
(d) char
(e) cell
6. Consider the following function that extracts a specific row of an input array:

```matlab
function [n, row] = rowcall(array)
    row = array(1,:);
    n = length(row);
end
```

What does `n = rowcall([3 3 3; 5 7 9; 1 8 6])` return? 

(a) 3  
(b) 9  
(c) 3 3 3 
(d) 5 7 9 
(e) None of the above

7. After executing the following code, what would be the value of `z`?

```matlab
x = 2/3;
y = .6667;
z = 7;

if x == y
    z = 10;
elseif x-y == 0
    z = 5;
else
    z = 14;
end
```

(a) 7  
(b) 10  
(c) 5  
(d) 14  
(e) The code would produce an error.
8. Consider the following anonymous function:

\[ F(x, y) \times \cdot 2 + y \cdot \cdot 2; \]

What would be returned by the following function call?

\[ a = F([1, 2], [3, 4]) \]

(a) \( a = 10 \)
(b) \( a = 30 \)
(c) \( a = [10, 20] \)
(d) \( a = [10, 30] \)
(e) An error message stating anonymous functions can only be used for 1x1 inputs.

9. Among \( e, f, g, \) and \( h, \) which one is not equal to the others?

\( e = \text{'Michigan'}; \)
\( b = \text{'California'}; \)
\( c = \text{'Georgia'}; \)
\( e = a([5, 7]) \cdot \cdot 0 \)
\( f = b(9:10); \)
\( g = c(6: end); \)
\( h = b(4:-2:1); \approx 4, \approx \cdot \cdot 0 \)

(a) \( e \)
(b) \( f \)
(c) \( g \)
(d) \( h \)
(e) all are equal

Fill in the line of code for calculating the factorial of a number.

```python
function x = factorial(n)
    if n < 1
        x = 1;
    else
        x = \_\_\_\_\_;
    end
end
```

(a) \( n \cdot (n-1) \)
(b) \( \text{factorial(n)} \)
(c) \( (n-1) \cdot \text{factorial(n-2)} \)
(d) \( n \cdot \text{factorial(n-1)} \)
(e) \( \text{factorial(n)} \cdot \text{factorial(n-1)} \)
Consider the following function added to your path or in your working directory:

```matlab
function [value] = myBrokenFunction(z, debugger)
    if debugger == 1
        disp('I like to debug my functions')
    else
        disp('I cannot find where I accidentally switch plus and minus signs')
        value = n - 1;
    end
end
```

With a debug point on line 4, you enter `myBrokenFunction(3,0)` into the command window. What happens?

(a) The code runs up to line 4 and stops.
(b) The char array 'I like to debug my functions' is displayed on the screen, then the code stops at line 4.
(c) The code runs up to line 4 and stops. If I hit continue, the char array 'I cannot find where I accidentally switch plus and minus signs' and ans=2 are displayed on the screen.
(d) 'I cannot find where I accidentally switch plus and minus signs' and ans=2 are displayed on the screen.
(e) None of the above

Consider the following function:

```matlab
function [outvec]=countupto(invec,upto)
    i = 1;
    outvec=[]
    while i <= upto
        outvec(i) = invec(i);
        outvec = [i]
    end
end
```

What is the maximum value i will assume when this function is run with `vec = countupto([1,2,4,3,5,7,7,9,0],6)`?

(a) 1
(b) 5
(c) 6
(d) 500
(e) Inf
13. Consider the following while loop

```plaintext
A = 1;
i = 1;
while A < 100
    A = A * 2^(i-1);
    result(i) = A;
i = i + 1;
end
```

What is the length of `result` when the while loop ends?

(a) 5
(b) 4
(c) 3
(d) 6
(e) None of the above

14. The variables A, B and C are defined below:

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

which of the following commands will generate an error?

(a) `transpose(B)*C`
(b) `transpose(C*B)`
(c) `A*C transpose(B)*C`
(d) `A.*transpose(B)`
(e) None of the above

15. What is the value of `count` after the following code is run?

```plaintext
count = 1;
for i = 1:5
    count(i) = sum(count*i);
end
```

(a) `count = 360`
(b) `count = [1, 2, 6, 24, 120]`
(c) `count = [1, 2, 9, 48, 300]`
(d) `count = [1, 4, 9, 16, 25]`
(e) No result is achieved for `count` because of an error
Consider this function for the following two questions:

\[
\begin{align*}
  f(x, y) &= \begin{cases} 
    0 & \text{if } x < 0 \\
    2y & \text{if } x \geq 0 \text{ and } y \leq 0 \\
    f(x-1, f(x-2, y-3)) & \text{if } x \geq 0 \text{ and } y > 0
  \end{cases}
\end{align*}
\]

Corresponding MATLAB function:

```matlab
function [result] = p_wise(x, y)
    if x < 0
        result = ___________ \% Blank 1
    elseif x >= 0 && y <= 0
        result = ___________ \% Blank 2
    else
        result = ___________ \% Blank 3
    end
end
```

16. What are the correct lines of code that belong in blanks 1, 2, and 3, respectively?

(a) 0;
    2*y;
    p_wise(x - 1, p_wise(x - 2, y - 3));
(b) 0;
    2*y;
    p_wise(x - 1), p_wise(x - 2, y - 3);
(c) 0;
    2*y;
    p_wise(x - 1, p_wise(x - 2, y - 3));
(d) 0;
    2*y;
    f(x - 1, f(x - 2, y - 3));
(e) 0;
    2*y;
    p_wise(x - 1, p_wise(x - 2) (y - 3));

17. What is the output of \( [\text{result}] = p\_wise(2, 2) \)?

(a) result = 4
(b) result = 0
(c) result = -2
(d) result = -4
(e) No result is achieved because of infinite recursion
You run the following code:

```matlab
rng(1)
A = randi(5,1,4)
```

and the result you obtain is:

```
A =
   3   4   1   2
```

What will be the value of `a` after you write:

```matlab
rng(1)
a = randi(5)
```

(a) 3
(b) 4
(c) 5
(d) None of the above
(e) We can't tell

19. Consider the following function that computes the square and cube of each value for any given vector:

```matlab
function [sqvec, cubvec] = countvec(invec)
    lengthvec = length(invec);
    sqvec = zeros(1, lengthvec);
    cubvec = zeros(1, lengthvec);
    for k = 1:lengthvec
        sqvec(k) = invec(k)^2;
    end
    for m = 1:lengthvec
        cubvec(m) = invec(m)^3;
    end
end
```

What is the time complexity of the function for a given input vector of length `n`, using big-O notation?

(a) \(O(1)\)
(b) \(O(n)\)
(c) \(O(n^2)\)
(d) \(O(n^3)\)
(e) None of the above
20. After executing the following piece of code, what value does \( x \) have?

\[
\begin{align*}
a &= 50; \\
b &= .01; \\
c &= \text{eps}(a)/2; \\
d &= \text{eps}(b); \\
x &= (a + d) == a; \quad \text{1} \\
y &= (a + c) == a; \quad \text{1} \\
z &= (b + 2*c) == b; \\
x &= x + y + z
\end{align*}
\]

Note that Matlab's documentation on \text{eps} includes: "d = \text{eps}(x) is the positive distance from abs(x) to the next larger in magnitude floating point number of the same precision as x."

(a) 1  
(b) 0  
(c) 3  
(d) 2  
(e) None of the above

21. Which of the following sorting methods is typically coded as a recursive process?

(a) Bubble Sort  
(b) Selection Sort  
(c) Quick Sort  
(d) All of the above  
(e) (b) and (c) only

22. Given the following code, what does \text{myFunction('12345')} return?

```matlab
function [output] = myFunction(input) 
  output = 0; 
  for i = 1:length(input) 
    if input(i) == i 
      output = output + 1; 
    end 
  end 
  return 
end
```

(a) 0  
(b) 1  
(c) [1 2 3 4 5]  
(d) 15  
(e) It will return an error
23. Consider the following function:

```matlab
function [vector] = mySelection(vector)
    for i = 1:length(vector) - 1:3
        [minvalue, index] = min(vector(i:end)); // [1,3]
        vector([i, i+1+index]) = vector([i-1+index, i])
    end
end
```

What is the first line displayed in the command window when `mySelection([2 0 1])` is called?

(a) 2 0 1  
(b) 0 1 2  
(c) 0 2 1  
(d) 2 1 0  
(e) None of the above

24. What is the decimal number represented by the signed binary representation $\tilde{0}0110100$?

(a) 180  
(b) -180  
(c) 45  
(d) -22  
(e) -52

25. For an already sorted input array (the best case scenario), what is the minimum time complexity for a well-chosen sorting algorithm as a function of $n$, the length of the input array that is to be sorted?

(a) $O(1)$  
(b) $O(\log n)$  
(c) $O(n)$  
(d) $O(n \log n)$  
(e) $O(n^2)$