1. Consider the following code.

```
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:

```
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

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3. What is the value of result when executing the following code?

```
array = [10, 1, NaN, -2]
if array(1) > 2
    output = 3;
elseif array(2) < 0
    result = 0;
elseif array(3) ~= NaN
    result = 1;
elseif 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 commmand line, what value does **ans** have?

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

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

5. You run the following code:

```
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

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6. Consider the following function that extracts a specific row of an input array:

```
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`?

```
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.

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8. Consider the following anonymous function:

```
F = @(x,y) x.^2 + y.^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, h`, which one is not equal to the others?

```
a = 'Michigan';
b = 'California';
c = 'Georgia';
e = a([5, 7]);
f = b(9:10);
g = c(6:end);
h = b(4:-2:1);
```

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

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

```
function x = factorial(n)
    if n<=1
        x = 1;
    else
        x = _____;
    end
end
```

(a) `n*(n-1)`
(b) `factorial(n)`
(c) `(n-1)*factorial(n-2)`
(d) `n*factorial(n-1)`
(e) `factorial(n)*factorial(n-1)`

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11. Consider the following function added to your path or in your working directory.

```
1 function [value] = myBrokenFunction(n,debugger)
2 if debugger == 1
3     disp('I like to debug my functions')
4     value=n+1;
5 else
6     disp('I cannot find where I accidentally switch plus and minus signs')
7     value = n - 1;
8 end
9 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

12. Consider the following function:

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

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13. Consider the following while loop

```
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?

```
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

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Consider this function for the following two questions:

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

Corresponding MATLAB function:

```
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;
2y;
p_wise(x - 1, p_wise(x - 2, y - 3));
```

(d)
```
0;
2*y;
f(x - 1, f(x - 2, y - 3));
```

(e)
```
0;
2y;
p_wise(x - 1, p_wise(x - 2) (y - 3));
```

17. What is the output of `[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

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18. You run the following code:

```
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:

```
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:

```
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

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20. After executing the following piece of code, what value does `x` have?

```
a = 50;
b = .01;
c = eps(a)/2;
d = eps(b);
x = (a + d) == a;
y = (a + c) == a;
z = (b + 2*c) == b;
x = x + y + z
```

Note that Matlab's documentation on `eps` includes: "`d = 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 `myFunction('12345')` return?

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

(a) 0
(b) 1
(c) [1 2 3 4 5]
(d) 15
(e) It will return an error

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23. Consider the following function:

```
function [vector] = mySelection(vector)
    for i = 1:length(vector)
        [minvalue,index] = min(vector(i:end));
        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 10110100 ?

(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) $O(n^2)$

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