

## Week 2-2: Octave Matlab Tutorial

1. Suppose I first execute the following in Octave/Matlab:

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

Which of the following are valid commands? Check all that apply.

☐ `C = A' + B`

☐ `C = B * A`

2. Let  $A = \begin{bmatrix} 16 & 2 & 3 & 13 \\ 5 & 11 & 10 & 18 \\ 9 & 7 & 6 & 12 \\ 4 & 14 & 15 & 1 \end{bmatrix}$ . Which of the following expressions gives  $B = \begin{bmatrix} 16 & 2 \\ 5 & 11 \\ 9 & 7 \\ 4 & 14 \end{bmatrix}$ ?  
Check all that apply.

☐ `B = A(:, 1:2)`

☐ `B = A(1:4, 1:2)`

3. Let  $A$  be a 10x10 matrix and  $x$  be a 10-element vector. Your friend wants to compute the product  $Ax$  and writes the following code:

```
v = zeros(10, 1);  
for i = 1:10  
    for j = 1:10  
        v(i) = v(i) + A(i, j) * x(j);  
    end  
end
```

How would you vectorize this code to run without any FOR loops? Check all that apply.

☐ `v = A * x`

4. Say you have two column vectors  $v$  and  $w$ , each with 7 elements (i.e., they have dimensions  $7 \times 1$ ). Consider the following code:

```
z = 0;
for i = 1:7
    z = z + v(i) * w(i)
end
```

Which of the following vectorizations correctly compute  $z$ ? Check all that apply.

```
z = sum(v.*w)

z = w' * v
```

5. In Octave/Matlab, many functions work on single numbers, vectors, and matrices. For example, the  $\sin()$  function when applied to a matrix will return a new matrix with the  $\sin()$  of each element. But you have to be careful, as certain functions have different behavior. Suppose you have an  $7 \times 7$  matrix  $X$ . You want to compute the log of every element, the square of every element, add 1 to every element, and divide every element by 4. You will store the results in four matrices,  $A$ ,  $B$ ,  $C$ ,  $D$ . One way to do so is the following code:

```
for i = 1:7
    for j = 1:7
        A(i, j) = log(X(i, j));
        B(i, j) = X(i, j) ^ 2;
        C(i, j) = X(i, j) + 1;
        D(i, j) = X(i, j) / 4;
    end
end
```

Which of the following correctly computes  $A$ ,  $B$ ,  $C$ , or  $D$ ? Check all that apply.

```
C = X + 1

D = X / 4

A == log(X)
```