

1. Suppose I first execute the following Octave commands:

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

Which of the following are then valid Octave commands? Check all that apply and assume all options are written in an Octave command. (Hint: A' denotes the transpose of A.)

☐ C = A' + B;

☒ C = B * A;

☐ C = A + B;

☐ C = B' * A;

2. Question text

$$\text{Let } A = \begin{bmatrix} 16 & 2 & 3 & 13 \\ 5 & 11 & 10 & 8 \\ 9 & 7 & 6 & 12 \\ 4 & 14 & 15 & 1 \end{bmatrix}.$$

Which of the following indexing 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);

☐ B = A(0:2, 0:4)

☐ B = A(1:2, 1:4);

3. Let A be a 10×10 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.

- ☒ $v = A * x;$
- ☐ $v = Ax;$
- ☐ $v = x' * A;$
- ☐ $v = \text{sum}(A * x);$

4. Say you have two column vectors v and w , each with 7 elements (i.e., they have dimensions 7×1). 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.

- ☒ $z = \text{sum}(v .* w);$
- ☒ $z = v' * w;$
- ☐ $z = v * w';$
- ☐ $z = v .* w;$

5. In Octave, 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 7×7 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 compute A, B, C , or D ? Check all that apply.

- ☐ $C = X + 1;$
- ☒ $D = X / 4;$
- ☐ $B = X.^2;$
- ☐ $B = X^2;$