

Octave/Matlab Tutorial

5 questions

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1.

Suppose I first execute the following in Octave/Matlab:

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

Which of the following are then valid commands? Check all that apply. (Hint: A' denotes the transpose of A.)

☐ C = A' + B;

☐ C = B * A;

☐ C = A + B;

☐ C = B' * A;

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2.

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

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);

☐ $B = A(1:4, 1:2);$

☐ $B = A(0:2, 0:4)$

☐ $B = A(1:2, 1:4);$

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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:

```
1 v = zeros(10, 1);
2 for i = 1:10
3     for j = 1:10
4         v(i) = v(i) + A(i, j) * x(j);
5     end
6 end
```

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

☐ $v = A * x;$

☐ $v = Ax;$

☐ $v = A .* x;$

☐ $v = \text{sum}(A * x);$

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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:

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

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

☐ $z = \text{sum}(v .* w);$

☐ $z = w' * v;$

☐

☐ $z = v * w;$

☐ $z = w * v;$

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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 7×7 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:

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

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

☐ $C = X + 1;$

☐ $D = X / 4;$

☐ $A = \log(X);$

☐ $B = X ^ 2;$

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