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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. 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);
- ☐ B = A(0:4, 0:2);

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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:

```
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 = 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 7x1). 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 = 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 7x7 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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