What is vectorized code?

Consider the two code fragments below. Both accomplish the same thing and use vectors, but one fragment is vectorized while the other is not.

```
% Vectorized code
  a= rand(1,4);
  b= rand(1,4);
  c= a + b;
```

```
% Non-vectorized code
  a= rand(1,4);
  b= rand(1,4);
  for k= 1:length(a)
      c(k)= a(k) + b(k);
  end
```

Vectorized code refers to operations that are performed on *multiple components of a vector* at the same time (in one statement). Note that the addition (arithmetic operation) in the left code fragment is performed on *all (multiple) components* of the vectors `a` and `b` in one statement. The addition on the right code fragment, however, is performed on *one* component of vector `a` and *one* component of vector `b` at a time—it is through the use of the loop (and appropriate indexing) that all components in the vectors are added.

Below is another example on vectorized code and its non-vectorized counterpart:

```
% Vectorized code
  a= rand(1,3)
  b= 7;
  c= [a b];
```

```
% Non-vectorized code
  a= rand(1,3);
  b= 7;
  c= zeros(1,4);
  for k= 1:length(c)-1
      c(k)= a(k);
  end
  c(4)= b;
```

Vector concatenation is vectorized code! In general, vectorized code replaces the loop for moving through a vector.

Is using a built-in function the same as using vectorized code? *No*. For example, if you write the statement `s=sum(v)`, you are calling a function and that is not vectorized code. The function `sum` may or may not use vectorized code to do the summing, but the function *call* that you write is just that, a function call—*it* does not perform an operation on multiple components. Similarly, initializing a vector using functions such as `ones` and `zeros` is *not* considered vectorized code.

Be sure to follow instructions on an exam! On some questions we want to see that you have mastered loops and indexing and therefore do not allow vectorized code. Similiarly, we may forbid the use of specific built-in functions on a question. A significant penalty will be applied if you do not follow instructions.