Pointers

1. What is terrible about the following function?
   ```c
   int *blasphemy(void) {
       int x;
       return &x;
   }
   ```

2. What is wrong about the following function that swaps the values of two int variables? What changes need to be made for swappy to function correctly?
   ```c
   void swappy( int a, int b) {
       int temp = a;
       a = b;
       b = temp;
   }
   ```

3. What does the following function do?
   ```c
   int mystery(int *arr, int n) {
       return (n ? arr[0] + mystery(arr + 1, n -1) : 0;
   }
   ```

Bitwise Operators

C provides bitwise commands for AND (&), OR (|), XOR (^), and NOT (~). Ignoring NOT for now, let's see what happens when we reduce the 2-input gates to 1-input gates by fixing the second input.

1. Let x be the input. Fill in the following blanks with either 0, 1, x, or \( \bar{x} \) (NOT x):
   - \( x \& 0 = \) ______
   - \( x | 0 = \) ______
   - \( x ^ 0 = \) ______
   - \( x \& 1 = \) ______
   - \( x | 1 = \) ______
   - \( x ^ 1 = \) ______

2. Based on your responses, look at the columns (grouped by operation) above. Which operation would be useful for turning bits OFF? For turning bits ON? For flipping bits?
Complete the implementation of the following functions based on the comments.

1. Increments the value of an int outside this function by one.
   ```c
   void increment( int *x ) {
   }
   ```

2. Returns the number of bytes within a string. Do not use strlen().
   ```c
   int mystrlen( char* str ) {
   }
   ```

3. Returns the number of elements in an array *arr of ints. The array must be able to store any integer that fits in the array.
   ```c
   int arraylen( int array[] ) {
   }
   ```

**Structs**

Structs are user-defined collections of variables. A structure definition goes as follows:

```c
struct structure_tag {
    type1 member1;
    ...
    typen membern;
};
```

What does each of the four following statements do?

```c
struct {int x; int y;} var;
struct point {int x; int y;};
struct point {int x; int y;} pt1;
struct point {int x; int y;} pt1 = {1,2};
```