**Take Home: Quiz 4 (15 pts) – C++, Data Structures, and OOP**

**1. (4 pts)** In your own words, what is a *copy* constructor?

A copy constructor initializes a newly-instantiated object with the values from a pre-existing object. Caution must be exercised here with pointers because if more robust behavior is not defined, only the pointer *values* are copied, and not the actual objects the pointers are pointing to, which could cause problems or unintended behavior.

**3. (4 pts)** In your own words, what is *encapsulation*?

Encapsulation is the bundling of data (attributes) and functions (methods) that act on the data, inside a given class. Encapsulation is also connected to the "black box" analogy, in that a user of a class does not need to know how the methods of an object work, only that they do and have well-defined behavior.

**3. (4 pts)** In your own words, what is the *rule of three* or the Law of Three?

Rule of three is a rule of thumb that says if a class explicitly defines any of the following three things it should explicitly define all three of them:

destructor, copy constructor, overloaded assignment operator

The reason behind this is that all three are physically manipulating memory and if at least one of the three is explicitly implemented it is dangerous to trust the default compiler implementations of the other two, as unintended and undesirable memory behavior (dangling pointers, memory leaks) may manifest.

**4. (3 pts)** In your own words, what is a *function overloading*?

Function overloading is allowing a specific function name to be multipurpose based on the number, type, and/or order of arguments. This is useful to design a function that has (probably similar but) different behavior based on the arguments that are passed into it, while being able to name the function the exact same thing for cleaner/more readable code.