CS21 Spring 2008, Swarthmore College, Practice Quiz 5

NAME:

1. Write a **recursive** function called `removeRecur` that takes a value and a list and returns a **new** list where all instances of that value have been removed.

   For example, `removeRecur(-1, [-1, 0, -1, 1, 2])` would return a new list `[0, 1, 2]`.

2. Write an **iterative** version of the same function called `removeIter`.

3. What types of algorithms are particularly well suited for recursive solutions? Explain why and give the name of one such algorithm.

4. Given a list with 64 items, what is the minimum and maximum possible number of iterations linear search will need to find a value in this list? What is the minimum and maximum number of iterations binary search will need?

5. You are presented with four algorithms that perform the same operation on an n element list. The four algorithms take n^2, n, $\log n$, and $n * \log n$ steps to run, respectively. Which algorithm is the best for large values of n? Which is the worst?

6. Write a recursive function to calculate $h(n)$ where:

$$h(n) = \begin{cases} 1 & \text{if } n = 1 \\ 2 * h(n-1) + 1 & \text{otherwise} \end{cases}$$

7. Below is a recursive function that returns `True` if the input string is a palindrome and returns `False` otherwise.

```
def palindrome(s):
    if s == "":
        return True
    elif s[0] != s[-1]:
        return False
    else:
        return palindrome(s[1:-1])
```

   Trace through a call to `palindrome("pop")` and draw the stack at the deepest point in the recursion.

8. Write a sort function (any sorting algorithm) that takes a list as a parameter and sorts the list. The function should not return anything; rather, it should mutate the input list so that it is sorted.