MREN 178 Week 6 Tutorial

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February 11, 2026

The topic for this week is time complexity, and in particular, complexity classes of functions.

Problem 1. Classify the complexity of each of the following functions.

(a) $2n^2 - 3n + 7$

(b) $\sum_{k=1}^{n} \sqrt{k}$

(c) a_n, where $a_0 = 1$ and $a_{k+1} = a_k + k^2$

Problem 2. For each of the following function, write a formula for the number of times the print statement is run, in terms of the input variables, and then classify the complexity of this function.

(a)
```c
void recursive(int n) {
    printf("I eat recursion for breakfast!\n");
    if (n <= 0) return;
    for (int i = 0; i < n; i++)
        recursive(i);
}
```

(b)
```c
void divide(int n, int k) {
    for (int i = n; i >= 1; i /= k)
        printf("I love algorithms!\n");
}
```

(c)
```c
int search(const int *array, int n, int target) {
    printf("Searching array of %d integers\n", n);
    if (n == 0)
        return -1;
    int halfway = n / 2;
    if (target < array[halfway])
        return search(array, halfway, target);
    if (target > array[halfway])
    {
        int result = search(array + halfway + 1, n - halfway - 1, target);
```

```
        return result >= 0 ? result + halfway + 1 : result;
    }
    return halfway;
}
```