

# CSI 31 LECTURE NOTES (Ojakian)

## Topic 16: Functional Recursion

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### OUTLINE

(References: 11.3, 11.4)

1. Functional Recursion
  2. Binary Search
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### 1. Examples

**PROBLEM 1.** Write a function that computes the factorial. Do it in two ways: First with loops and then with functional recursion.

**PROBLEM 2.** Calculate the maximum of a list using recursion (without using the `max` function).

### 2. Functional Recursion

- (a) Must have sufficient base cases.
- (b) Must make “progress” towards base case
- (c) Strategy:
  - i. Calculates base case(s)
  - ii. Non base cases: Calculated correctly assuming the simpler case calculates correctly.
- (d)

**\*PROBLEM\* 3.** Use recursion to find the sum of the squares of a list of numbers.

### 3. Binary Search

#### **PROBLEM 4.**

- (a) In the worst case, how long does it take to search a list to determine whether or not it contains a given value?
- (b) Write a program that implements **Binary Search** to search a sorted list in order to determine if a given value is in the list or not.