## Math 395/CS 395 - Analysis of Algorithms - Spring 2022

## Homework 3 Due: Friday, April 8, 2022

- Please include a problem sheet.
- Read/review sections 2.1-2.3, 3.1, 3.2

## **PROBLEMS:**

1. Horner's rule for evaluating a polynomial P(x) is presented on page 41. In terms of  $\Theta$ -notation, what is the running time of that code fragment for Horner's rule?

Write pseudocode to implement the naive polynomial-evalution algorithm that computes each term of the polynomial from scratch. What is the running time of this algorithm? How does it compare to Horner's rule?

- 2. Let f(n) and g(n) be asymptotically nonnegative functions. Using the basic definition of  $\Theta$ -notation, prove that max  $(f(n), g(n)) = \Theta(f(n) + g(n))$ .
- 3. Show that for any real constants a and b, where b > 0,

$$(n+a)^b = \Theta(n^b)$$

- 4. Explain why the statement, "Running time of algorithm A is at least  $O(n^2)$ ", is meaningless.
- 5. Is  $2^{n+1} = O(2^n)$ ? Is  $2^n = O(2^n)$ ?