

4. Homework

Due **10/14/09** before class

Please refer to the corresponding exercise sections in the textbook (Rosen, 6th edition).

2.3 (page 146)

- (a) (1 point) Give the functional notation for the function described in 6a, including domain and range (the co-domain should equal the range).
- (b) (4 points) Determine which of the functions in 12 c,d are one-to-one, onto, or both. Prove your answers.
- (c) (2 points) 16d. Prove your answers.
- (d) (1 point) Find $f \circ g$ and $g \circ f$ where $f, g : \mathbb{R} \rightarrow \mathbb{R}$ with $f(x) = 3x + 5$ and $g(x) = x^2$.

2.4 (page 160)

- (a) (1 point) 4d
- (b) (1 point) 10b
- (c) (2 points) Use index substitution to rewrite the following summation such that the index starts at 0. Then apply the geometric series theorem to compute the value of the summation.

$$\sum_{i=2}^{10} (1/3)^{(i-2)}$$

3.2 (page 191) Use the definitions of big-Oh, Omega, and Theta to solve the following exercises.

- (a) (1 point) Prove that $5n^5 + 4n^4 + 3n^3 + 2n^2 + n \in O(n^5)$.
- (b) (2 points) 24a.
- (c) (2 points) 28
- (d) (3 points) Let $f, g, h : \mathbb{N} \rightarrow \mathbb{R}^+$. Prove that if $f(n) \in O(g(n))$ and $g(n) \in O(h(n))$ this implies that $f(n) \in O(h(n))$. (*Hint: Do not use the same name for different constants.*)