Homework Assignment 5
CS 2233
Section 001 and 002
Due: 11:59pm Friday, March 8

Problem 1. [10 points]
Complete all participation activities in zyBook sections 4.5, 7.1-7.3

Problem 2. [10 points]
Find $f \circ g$ and $g \circ f$ where $f, g: \mathbf{R} \to \mathbf{R}$ with $f(x) = 3x + 4$ and $g(x) = x^2$

Problem 3. [20 points]
Determine whether each of the following functions is $\mathcal{O}(x^2)$. If a function is $\mathcal{O}(x^2)$, then prove it by deriving witnesses c and n_0.
a. [5 points] $100x + 1000$
b. [5 points] $100x^2 + 1000$
c. [5 points] $\frac{x^3}{100} - 1000x^2$
d. [5 points] $x \cdot \log(x)$

Problem 4. [10 points]
a. [5 points] Use the definition of Big-Θ to show that $5n^5 + 4n^4 + 3n^3 + n$ is $\Theta(n^5)$
b. [5 points] Use the definition of Big-Θ to show that $2n^3 - n + 10$ is $\Theta(n^3)$

Problem 5. [10 points] Prove each of the following by deriving witnesses c and n_0.
a. [5 points] If $f(n)$ is $\mathcal{O}(g(n))$ and $a > 0$, then $a \cdot f(n)$ is $\mathcal{O}(g(n))$
b. [5 points] If $f(n)$ is $\Omega(g(n))$ and $g(n)$ is $\Omega(h(n))$, then $f(n)$ is $\Omega(h(n))$