CSE 332 Data Abstractions, Winter 2015
Section 2 Worksheet

Problem 1. Find values for v and n_0 (according to the definition of $O()$) for f(n) is $O(g(n))$, where:

a. $f(n) = 7n \qquad g(n) = \frac{n}{10}$

b. $f(n) = 1000 \qquad g(n) = 3n^3$

c. $f(n) = 7n^2 + 3n \qquad g(n) = n^4$

d. $f(n) = n + 2n \log n \qquad g(n) = n \log n$

Problem 2. True or false?

a. $f(n)$ is $\Theta(g(n))$ implies $f(n)$ is $O(g(n))$

b. $f(n)$ is $\Theta(g(n))$ implies $g(n)$ is $\Theta(f(n))$

c. $f(n)$ is $\Omega(g(n))$ implies $f(n)$ is $O(g(n))$

Problem 3. Find functions $f(n)$ and $g(n)$ such that $f(n)$ is $O(g(n))$ and the constant c for the definition of $O()$ must be > 1. That is, find f and g such that c must be greater than 1, as there is no sufficient n_0 when $c = 1$.

Problem 4. Write the $O()$ run-time of the functions with the following recurrence relations:

a. $T(n) = 3 + T(n-1)$, where $T(0) = 1$

b. $T(n) = 3 + T(n/2)$, where $T(1) = 1$

c. $T(n) = 3 + T(n-1) + T(n-1)$, where $T(0) = 1$

Problem 5. Prove by induction that

$$\sum_{i=0}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$$

Problem 6. What's the $O()$ run-time of this code fragment in terms of n:

a.
```
int x = 0;
for(int i = n; i >= 0; i--)
    if((i % 3) == 0) break;
        else x += n;
```

b.
```
int x = 0;
for(int i = 0; i < n; i++)
    for(int j = 0; j < (n * n / 3); j++)
        x += j;
```

c.
```
int x = 0;
for(int i = 0; i <= n; i++)
    for(int j = 0; j < (i * i); j++)
        x += j;
```