

CSE332 Week 2 Section Worksheet

1. Find values for  $c$  and  $n_0$  (according to the definition of  $O(\ )$ ) for  $f(n)$  is  $O(g(n))$ , where
  - a.  $f(n)=7n$ ,  $g(n)=n/10$
  - b.  $f(n)=1000$ ,  $g(n)=3n^3$
  - c.  $f(n)=7n^2+3n$ ,  $g(n)=n^4$
  - d.  $f(n)=n+2n\log n$ ,  $g(n)=n\log n$
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  $O(g(n))$
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  $f$  &  $g$  such that  $c$  must be greater than 1, as there is no sufficient  $n_0$  when  $c=1$ .
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  $T(0)=1$

5. Prove by induction that  $\sum_{i=0}^n i^2 = \frac{n(n+1)(2n+1)}{6}$

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;
```