Practice Assignment 1 Andrew Johnson

$(\log n+1)^3$ 7^{2n} $n^{1/2}$ $n^{\log_3 7}$ 2^{7n} $1000(\log n)^3$

1) $(\log n)^3$ 49^n $\sqrt{n}$ 128^n $(\log n)^3$

$2^{\log_2 n}$ $n\log n$ $5^{\log_3 n}$

n $n\log n$

$(\log n+1)^3$ $1000(\log n)^3$ $n^{1/2}$ $2^{\log_2 n}$ $n\log n$ $n^{\log_3 7}$ $5^{\log_3 n}$ 7^{2n} 2^{7n}

2) a) $\lim_{n\to\infty} \frac{3n+6}{10000n-500} = \frac{3}{10000}$ $\Theta(n)$

b) $\lim_{n\to\infty} \frac{n^{1/2}}{n^{2/3}} = 0$ $O(n^{2/3})$

c) $\lim_{n\to\infty} \frac{\log(7n)}{\log(n)} = 1$ $\Theta(\log(n))$

d) $\lim_{n\to\infty} \frac{n^{3/2}}{n\log n} = \infty$ $\Omega(n\log n)$

e) $\lim_{n\to\infty} \frac{\sqrt{n}}{(\log n)^3} = \infty$ $\Omega((\log n)^3)$

f) $\lim_{n\to\infty} \frac{n2^n}{3^n} = 0$ $O(3^n)$

$g(n) = 1 + c + c^2 + \ldots + c^n$ $c \in \mathbb{R}^+$

3) a) if $c<1$ then all $c^k < 1$, $1 \le k \le n$ so we look at the largest number which will be 1, therefore $O(1)$, and Σ

b) if $c=1$, then $g(n) = 1+n$ which makes $\Theta(n)$

c) if $c>1$ then c^n will be the largest value so $\Theta(c^n)$

4) $\lim_{n\to\infty} \frac{\log(n!)}{n\log n} = \lim_{n\to\infty} \frac{\log(n!)}{\log(n^n)} = \lim_{n\to\infty} \frac{n!}{n^n} = 1$

Therefore $\Theta(n\log n)$