
Asymptotics Practice Problems

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1. Order the following functions so that $f_i \in O(f_j) \iff i < j$:

(a) $f_1(n) = 3^n$

(b) $f_2(n) = \frac{n}{2}$

(c) $f_3(n) = 2^{10000}$

(d) $f_4(n) = 2^{\log_2 n}$

(e) $f_5(n) = \log n$

(f) $f_6(n) = n + n^2 \log n$

(g) $f_7(n) = n!$

(h) $f_8(n) = 1.001^n + n^3$

2. Provide the tightest bound on $f(n)$ in terms of $g(n)$ by saying $f = O(g)$, $f = \Omega(g)$, or $f = \Theta(g)$.

(a) $f(n) = \log_2 n$

$g(n) = \log_3 n$

(b) $f(n) = \log n^2$

$g(n) = \log n$

(c) $f(n) = n - 100$

$g(n) = n + 10000$

(d) $f(n) = 2^{1.1n}$

$g(n) = \sum_i^n i^2$

3. Find the tightest bound of the function $f(n) = x \sin x^2$ in both the worst and best case.