

Problem Set 1

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Course: Efficient Algorithms

August 5, 2020

Problem 1.1. Show that

- 1) $\frac{n(n-1)}{2} \in \mathcal{O}(n^2)$
- 2) $(n-1)! \in \mathcal{O}(n!)$
- 3) $\log_a n^c \in \mathcal{O}(\log_b n)$, $a, b > 0$
- 4) $n^2 + 2n \notin \mathcal{O}(n)$
- 5) $\sqrt{n} + 1 \in \mathcal{O}(n)$

Problem 1.2. Show that

- 1) $2n^2 + 5 \in \Omega(n)$
- 2) $(n-1)! \notin \Omega(n!)$
- 3) $n2^n \in \Omega(2^n)$
- 4) $3^n \in \Omega(2^n)$
- 5) $n \log_2 n \in \Omega(30n + 60)$

Problem 1.3. Show that

- 1) $n^2 + \frac{1}{n} \in \Theta(n^2)$
- 2) $55555 \in \Theta(1)$
- 3) If $f(n) \in \Theta(g(n))$ and $g(n) \in \Theta(h(n))$, $f(n) \in \Theta(h(n))$