

1. Show that the following statements are true:

- (a) $\frac{n(n-1)}{2}$ is $O(n^2)$
- (b) $\max(n^3, 10n^2)$ is $O(n^3)$
- (c) $\sum_{i=1}^n i^k$ is $O(n^{k+1})$ for integer k
- (d) If $p(x)$ is any k^{th} degree polynomial with a positive leading coefficient, then $p(n)$ is $O(n^k)$.

2. Which function grows faster?

- (a) $n^{\log n}$; $(\log n)^n$
- (b) $\log n^k$; $(\log n)^k$
- (c) $n^{\log \log \log n}$; $(\log n)!$
- (d) n^n ; $n!$.

3. If $f_1(n)$ is $O(g_1(n))$ and $f_2(n)$ is $O(g_2(n))$ where f_1 and f_2 are positive functions of n , show that the function $f_1(n) + f_2(n)$ is $O(\max(g_1(n), g_2(n)))$.

4. Prove or disprove: Any positive n is $O(\frac{n}{2})$.

5. Prove or disprove: 3^n is $O(2^n)$.