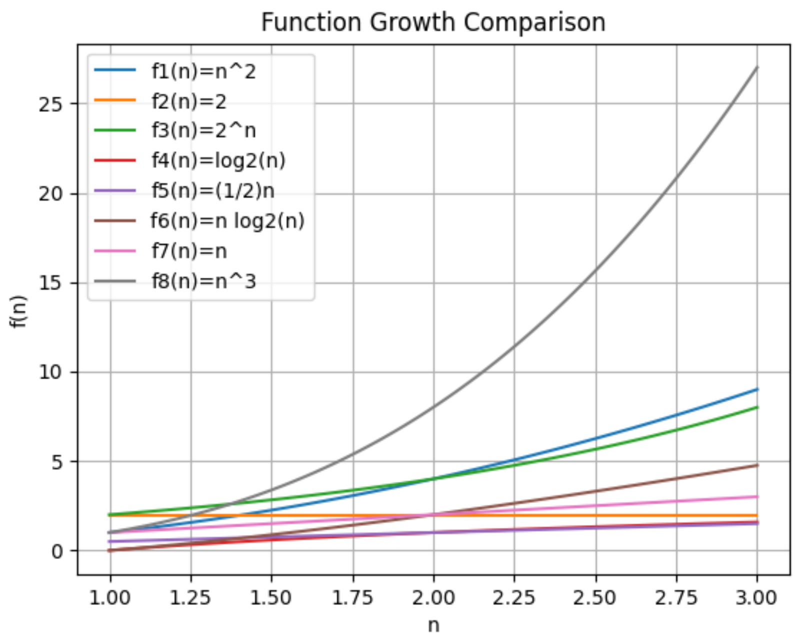
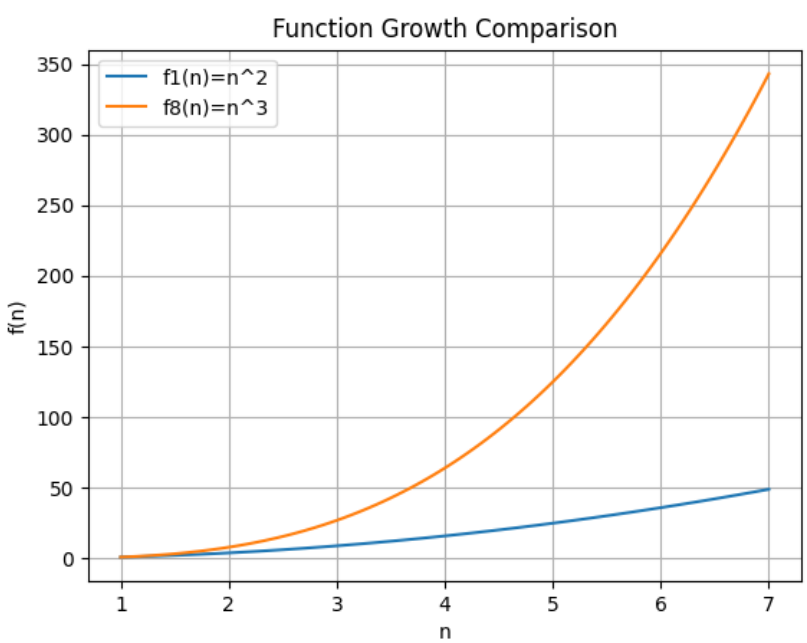
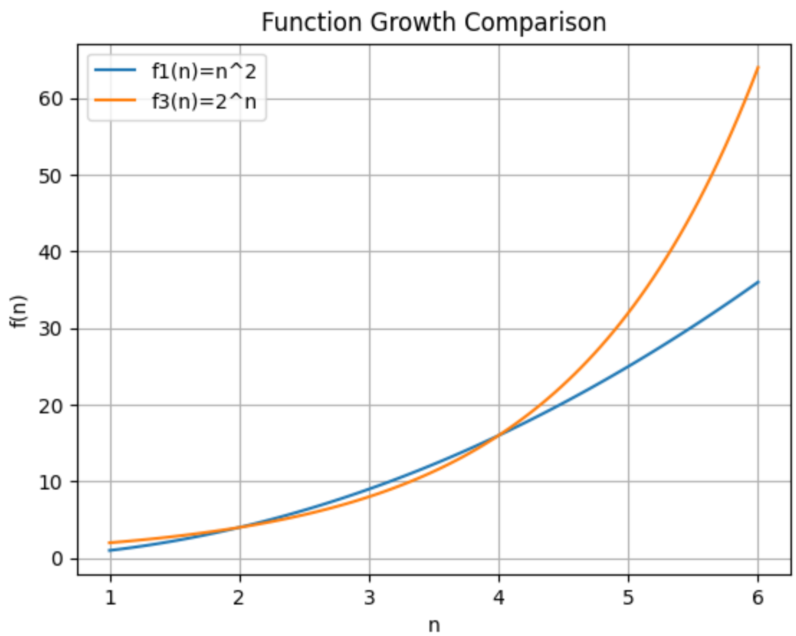
1) The following plot illustrates the growth rates of all functions. As they are tightly clustered together, it can be difficult to distinguish the differences. To gain clear understanding, let's analyze pairs of functions individually for a clearer comparison.



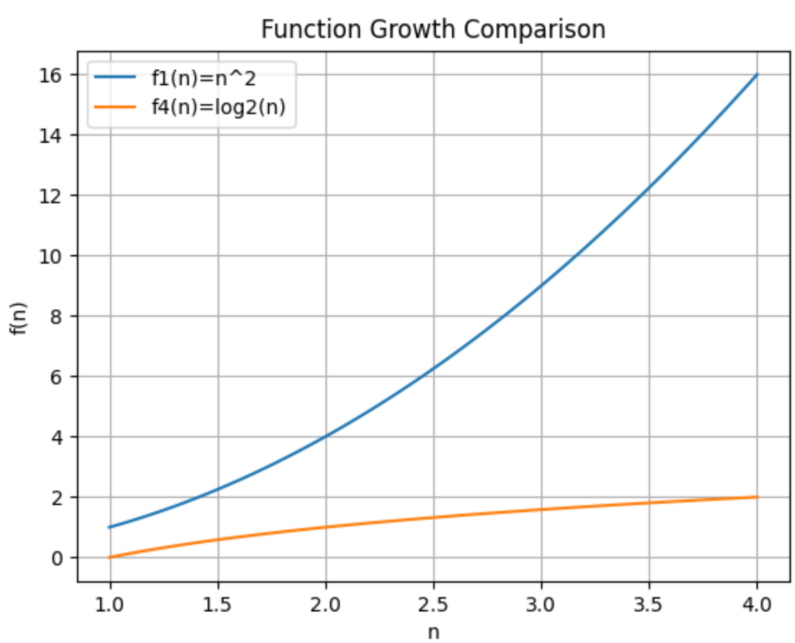
2) In the plot below, we can observe the growth of the functions n^2 and n^3. It is evident that n^3 quickly surpasses n^2, demonstrating a significant difference in their growth rates. Therefore, we can conclude that n^2 = O(n^3).



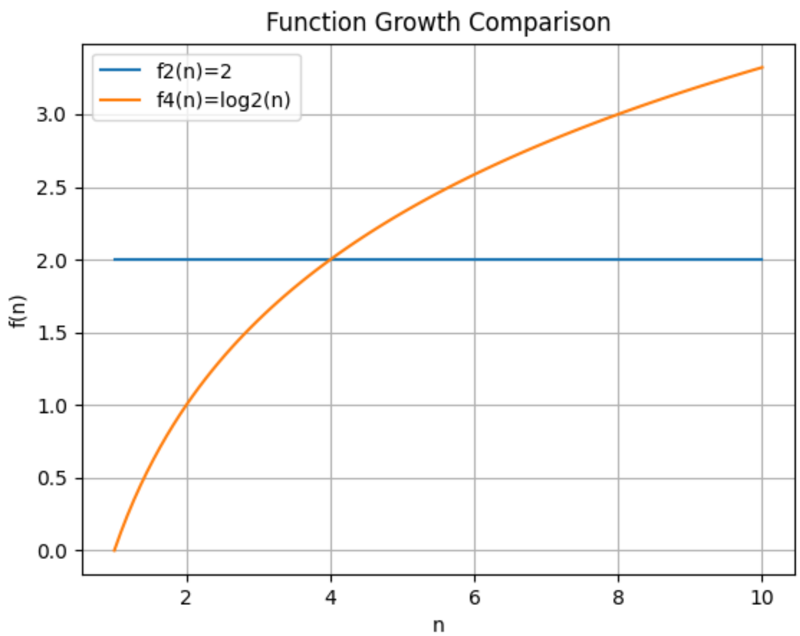
3) In the plot below, we can analyze the growth comparison between the functions 2^n and n^2. Initially, when n is very small, n^2 exhibits faster growth. However, it becomes apparent that 2^n quickly catches up, and for n0 ≈ 4, it surpasses n^2. As a result, we can conclude that n^2 = O(2^n).



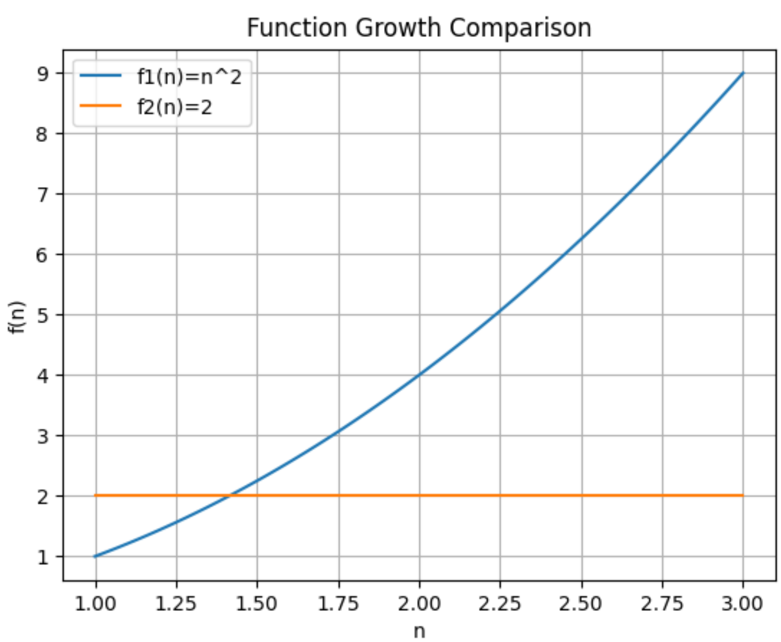
4) In the plot below, we can clearly observe the growth comparison between the functions n^2 and log2(n). It is evident that n^2 grows significantly faster, while log2(n) slows down as n increases. This difference in growth rates implies that there is no constant multiplier that would allow log2(n) to catch up to n^2. Therefore, we can confidently state that log2(n) = O(n^2).



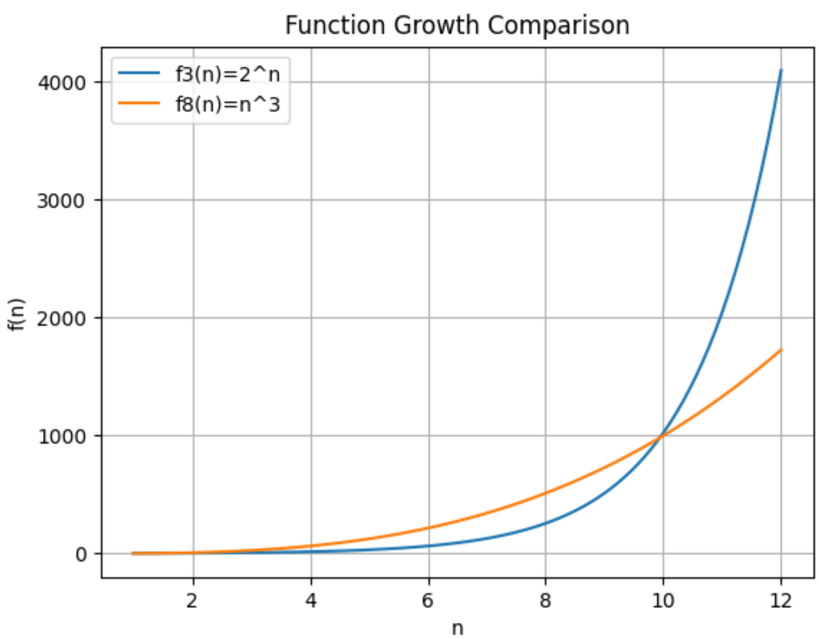
5) While a constant time function may appear to grow faster initially, as n increases, log2(n) eventually surpasses the constant function at the point n0 = 4. Beyond this point, log2(n) continues to grow, whereas the constant function remains at the same level indefinitely. Therefore, it can be concluded that T(1) = O(log2(n)).



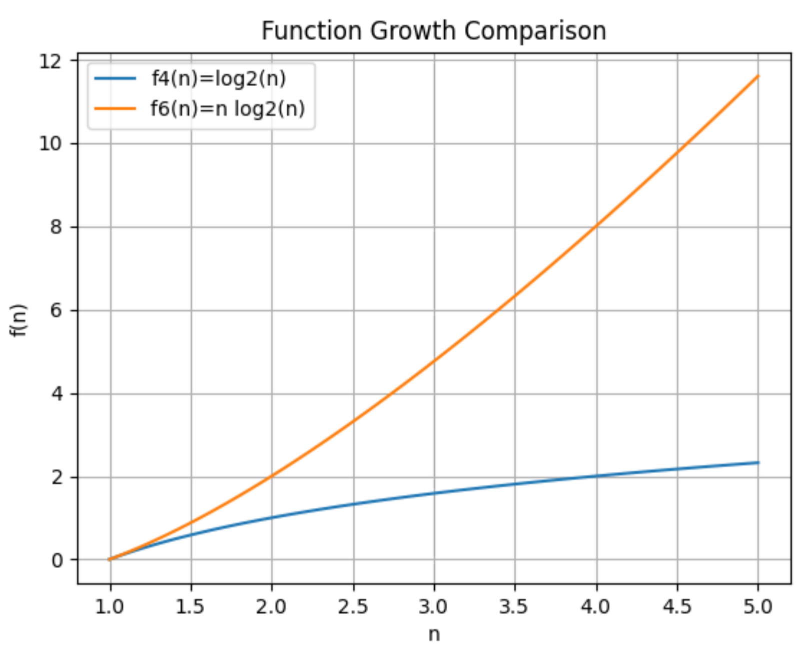
6) Similar to the previous plot, we can observe that n^2 eventually surpasses the constant function and exhibits faster growth. Therefore, it can be stated that T(1) = O(n^2).



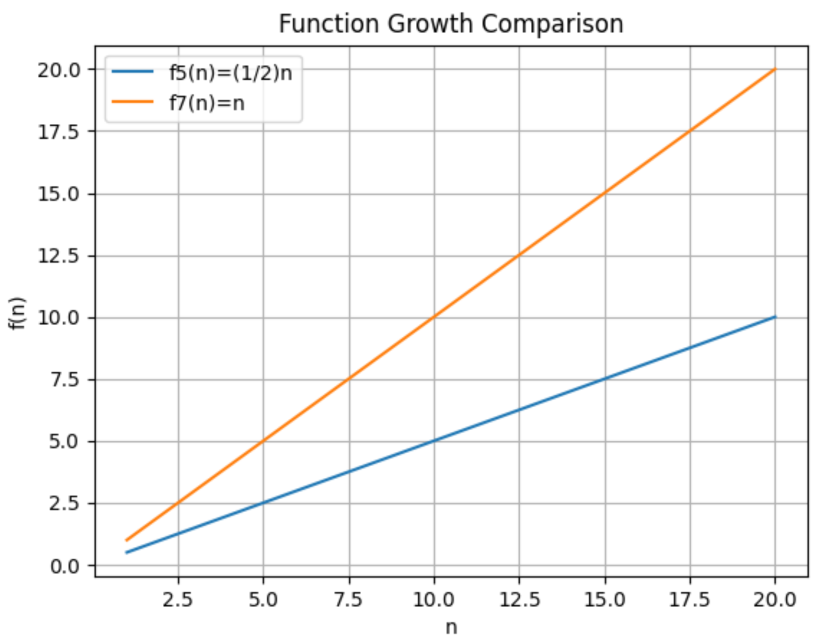
7) The following plot resembles the second plot presented in this file. In this pattern, we can observe that n^3 initially grows slower than 2^n until reaching n0 = 10. Beyond this point, 2^n overtakes n^3, providing clear evidence that exponential functions grow at a significantly faster rate than polynomial functions. Thus, it can be confidently asserted that n^3 = O(2^n).



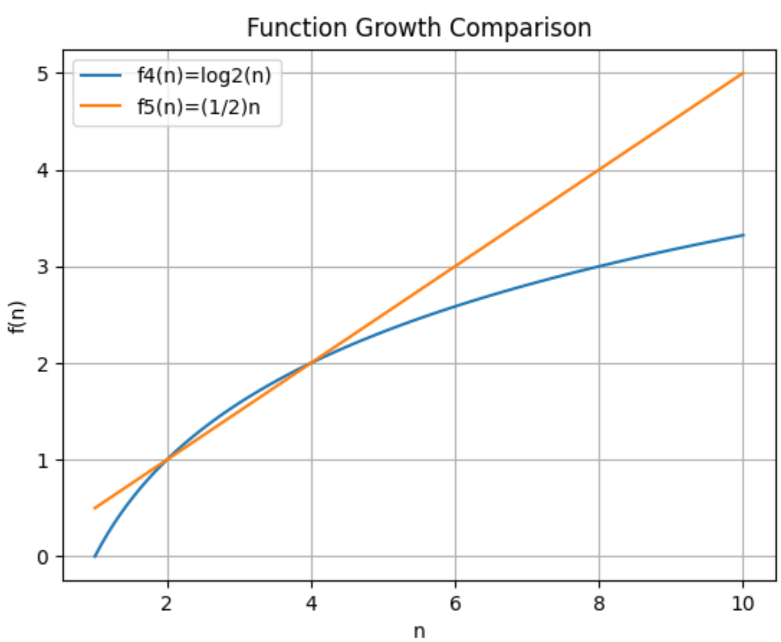
8) The following plot provides clear evidence that n log2(n) exhibits faster growth than log2(n). Therefore, we can conclude that log2(n) = O(n log2(n)).



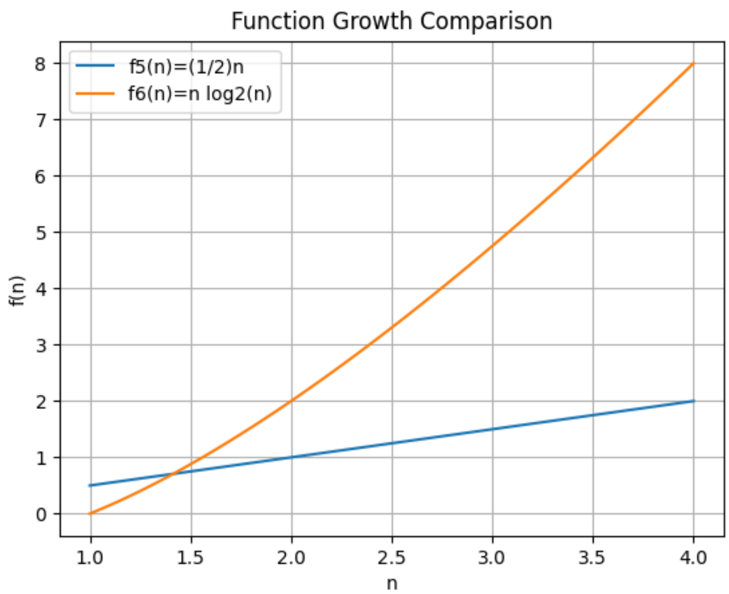
9) Based on the plot below, it's clear that n grows faster than (1/2)n. However, we can demonstrate that (1/2)n is indeed Θ(n) by identifying a constant multiple, c = 2, such that c * (1/2)n equals n. Therefore, we can confidently conclude that (1/2)n = Θ(n).



10) The following plot compares the functions (1/2)n and log2(n). While we know that logarithmic functions grow slowly, the question is whether log2(n) grows slower than (1/2)n. Clearly, as n increases, (1/2)n grows much faster than log2(n). Therefore, we can assert that log2(n) = O((1/2)n).



11) In the previous plot, we compared the functions log2(n) and (1/2)n and concluded that log2(n) = O((1/2)n). Now, let's consider the comparison between n log2(n) and (1/2)n. As we can see below, although (1/2)n initially tries to catch up to n log2(n), eventually, after the point n0 = 1.4, n log2(n) starts growing much faster. Therefore, it can be stated that (1/2)n = O(n log2(n)).



12) Let's examine the relationship between n log2(n) and n. Upon examining the plot below, we notice a similar pattern as we observed between n log2(n) and (1/2)n. Although n initially grows faster than n log2(n), eventually, after reaching the point n0 = 2, n log2(n) starts growing much faster. The key distinction between this and the previous graphs lies in the point at which n log2(n) surpasses n or (1/2)n. Consequently, it can be confidently asserted that n = O(n log2(n)).