CS 180 Homework 2

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Arrange in ascending order of growth rate.

Order:

lowest

① [redacted] $\log_{10}(10n)$	$= O(\log_{10}(n))$
② $\log_2 n^3$	$= O(\log_2(n))$
③ $a\log_{10}^2 n + b\log_{10} n + c$	$= O(\log_{10}^2 n)$
④ $\log_2^2 n$	$= O(\log_2^2 n)$
⑤ $\log_2^2(n+2n)$	$= O(\log_2^2 n)$
⑥ $\log_{10}^2 2^n$	$= O(n)$
⑦ $\log_2^2 n + 2n$	$= O(n)$
⑧ $\log_2^2 n^n$	$= O(n^2 \log_2^2 n)$

ascending

highest

Explanation:

To solve this, I first found the Big O of each function. From there, it was rather simple to organize: $n^2 > n > \log^2 n > \log n$. So we take our first two log functions, and we arrange them as we did because we know the higher the log base, the slower the growth. So, $\log_2$ grows more than $\log_{10}$. We can apply this same principle to our $\log^2$ functions, so we then place our $\log_{10}^2$ function next. The next two are both $\log_2^2$, meaning they have the same growth rate, so I placed $\log_2^2(n+2n)$ higher than $\log_2^2(n)$ simply because it starts higher. The next to are both $O(n)$, so I decided to place $\log_2^2 n + 2n$ higher because $2n$ grows faster than n. Then finally, we have $O(n^2 \log_2^2 n)$, which clearly has a much faster rate of growth than all of the other functions.