Section 4.2: Factorial and Exponential Growth

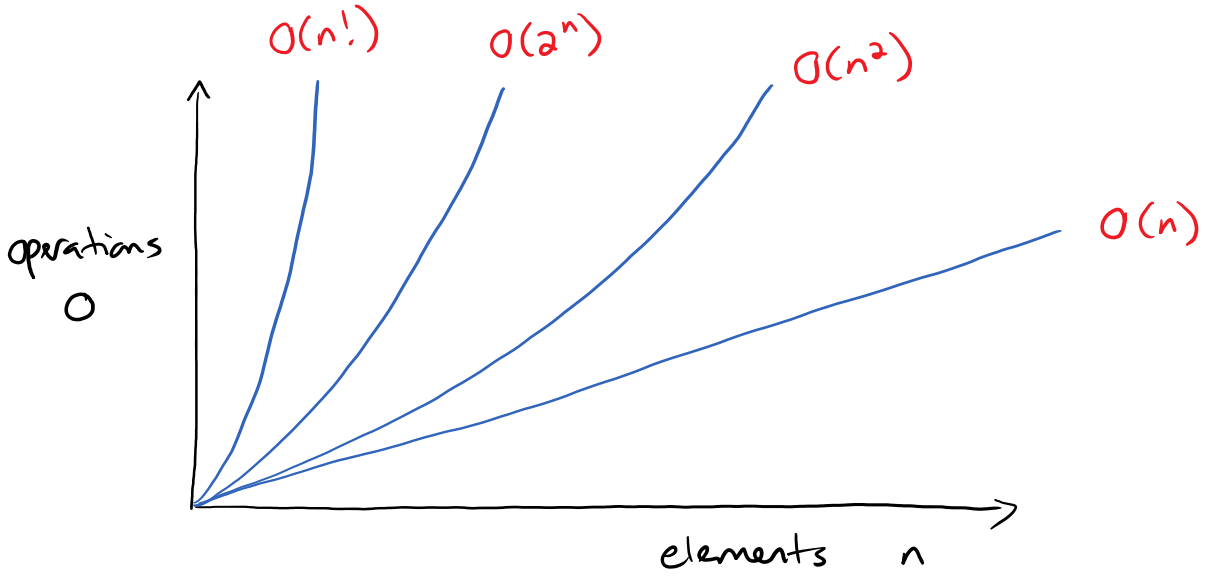
Thursday, February 13, 2020 1:38 PM

n	polynomial n^2	exponential 2^n	factorial $n!$
1	1	2	1
2	4	4	2
3	9	8	6
4	16	16	24
5	25	32	120
10	100	1024	3 628 800
100	10 000	1.267×10^{30}	9.33×10^{157}

note: $3! = 3 \cdot 2 \cdot 1$

$5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

$n! = n \cdot (n-1) \cdot (n-2) \cdots 3 \cdot 2 \cdot 1$



what I will be testing you on is ranking the

various orders: $O(n)$, $O(n^2)$, etc

so that you know the shape of each graph and are able to tell which one is more efficient (fewer operations) as n gets large

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What if the order of Big O looks like

$$O(n^2 + 2n + 5) \quad ?$$

what happens to this as n gets large?

n	n^2	$2n$	5	n^2+2n+5
1	1	2	5	8
10	100	20	5	125
100	10000	200	5	10205
1000	1000000	2000	5	1002005

as n gets very large, the contributions to the total from $2n$ and from 5 become very small in comparison to the contribution from the n^2 term

so for large n, $O(n^2 + 2n + 5) \approx O(n^2)$

↑

approximately
equal to