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ISC 4221C Professor Quaife
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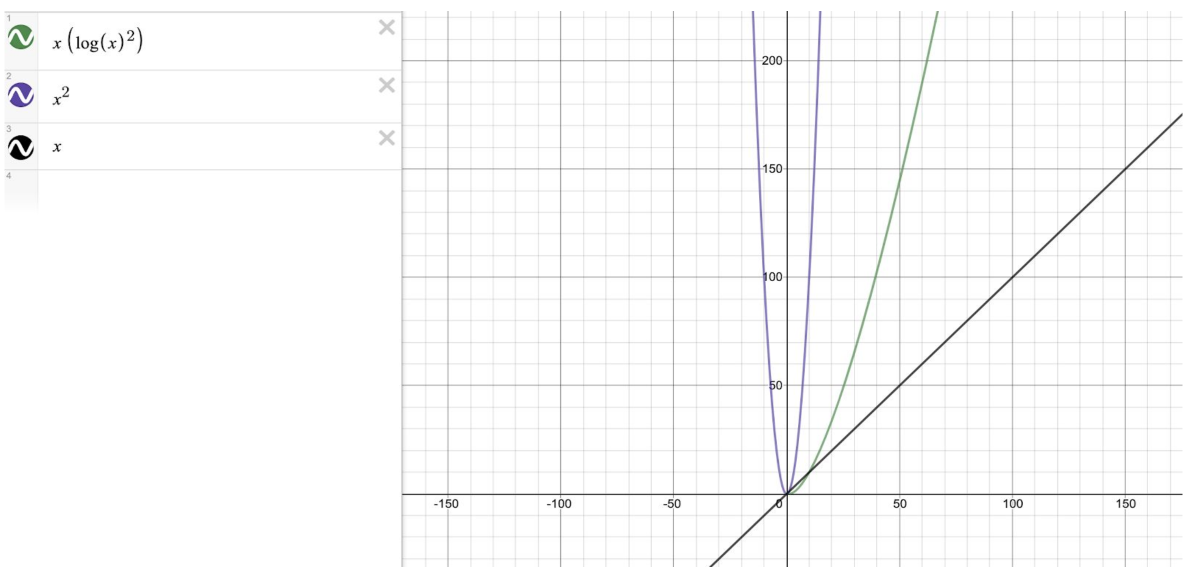
1.

$\log_{10} n$	n	2n	4n	$n \log_2 n$	n^2	n^3	n!
1	10	20	40	33.219	100	1000	3628800
2	100	200	400	664.38	10000	1000000	9.33×10^{157}
3	1000	2000	4000	9965.78	1000000	1000000000	infinity
4	10000	20000	40000	132877.1	100000000	1000000000000	infinity

2.
$d = 1,\ N < N(\log(N)^2 < N^2$



$$\lim_{n \to inf} \frac{n^2}{n\,(log(n)^{\,2})} = \frac{2n}{log(n)^2} = \frac{n}{log(n)} = n = \infty$$

$$\lim_{n \to 0} \frac{n}{n\,(log(n)^{\,2})} = \frac{1}{log(n)^2} = \frac{1}{-\infty} = 0$$

3. S = {15, 3, 5, 29, 42, 12}

1. Start at index 0, find the index of the lowest number. (1).
2. Swap index 0 with index 1.
    a. S = {3, 15, 5, 29, 42, 12}
3. Start at index 1, find the index of the lowest number (2).
4. Swap index 1 with index 2.
    a. S = {3, 5, 15, 29, 42, 12}
5. Start at index 2, find the index of the lowest number (5).
6. Swap index 2 with index 5.
    a. S = {3, 5, 12, 29, 42, 15}
7. Start at index 3, find the index of the lowest number (5).
8. Swap index 3 with index 5.
    a. S = {3, 5, 12, 15, 42, 29}
9. Start at index 4, find the index of the lowest number (5).
10. Swap index 4 with index 5.
    a. S = {3, 5, 12, 15, 29, 42}
11. The list is sorted.

4. $$\sum_{j=7}^{14} \frac{14!}{j!(14-j)!} \left(\frac{1}{2}\right)^{14} = \frac{9908}{16384} \sim .604$$

5.
Ω = {H,H}, {H,T}, {T,1}, {T,2}, {T,3}, {T,4}, {T,5}, {T,6}.
A = {T,1}, {T,2}, {T,3}.

p(A) = Independent events both with ½ chance of happening. ½ * ½ = ¼. But you can get a head, and flip again. The chance of getting a number less than four after that is ⅛. The intersection of those events is 1/32. P(A) = ½ + ⅛ - 11/32 = 11/32.

6.
$E(aX) = \frac{aX_1 + \ldots + aX_n}{n}$ Multiplying each X by a scalar *a* allows for the scalar to be factored out of the denominator. $E(aX) = \frac{a(X_1 + \ldots + X_n)}{n}$ *a* can then be taken out entirely to produce *aE(x)* where $E(X) = \frac{X_1 + \ldots + X_n}{n}$ similarly,

$V(aX) = \frac{\sum (aX_i - \mu)^2}{n} = \frac{(aX_1 - \mu)^2 + \ldots + (aX_n - \mu)^2}{n}$ a^2 can now be factored out. To produce a^2 V(X) …. I should have done this in LaTex.