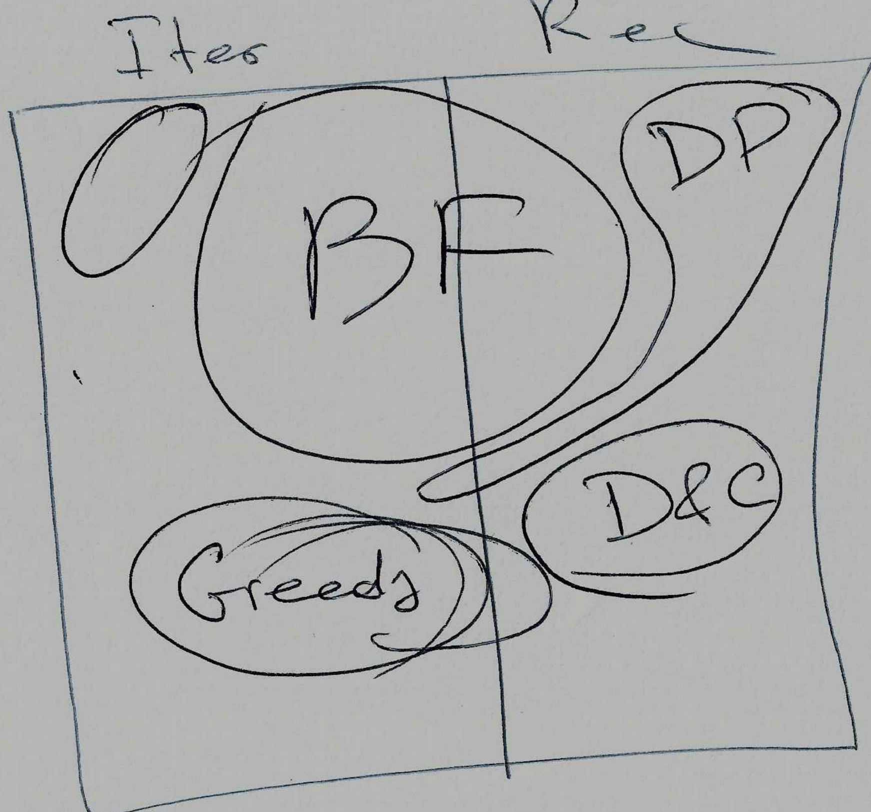
Why:



correctness
run-time

~~MS teams~~
Course website : slides, recording,
: submissions
pontus : Q&A
moodle
TODO

Logarithms

$\log_b a = c$ iff $b^c = a$

$b > 0,\ b \neq 1,\ a > 0$

$\log_2 4 = 2$

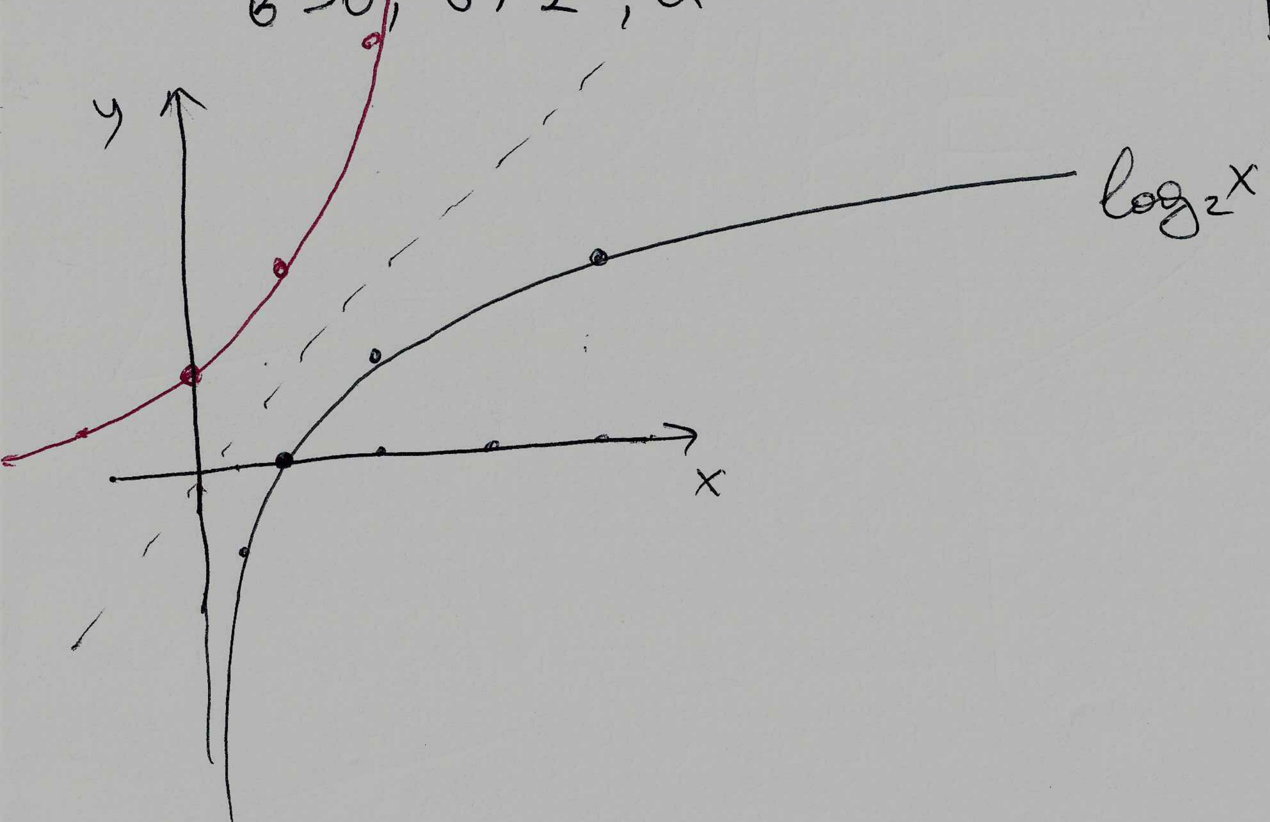
$\log_2 2 = 1$

$\log_2 1 = 0$

$\log_2 \frac{1}{2} = -1$

$\log_2 \sqrt{2} = \frac{1}{2}$

$\log_2 (-7)$ illegal



$$\log_b(b^c) = c$$

$$b^{\log_b a} = a$$

log-b(exp-b(c)) = c

exp-b(log-b(a)) = a

$\sin(x)$	sin(x)
$\sqrt{x}$	sqrt(x)
x^2	sqr(x)
x^5	
2^x	.....
....	
$\log_b \cancel{x}$	log-b(x)
b^x	exp-b(x)

x ^ 2

x ** 2

user

unary *

binary *

let's show

$$\log_b (a_1 * a_2) \stackrel{?}{=} \log_b a_1 + \log_b a_2$$

[since exponent is 1-1]

$$b^{\log_b (a_1 * a_2)} \stackrel{?}{=} b^{\log_b a_1 + \log_b a_2}$$

[using $x^{y+z} = x^y * x^z$]

$$a_1 * a_2 \stackrel{?}{=} b^{\log_b a_1} * b^{\log_b a_2}$$

$$a_1 * a_2 = a_1 * a_2$$ ✓

Proof

formal = mathem

-5

$\log_b(a_1 * a_2) = \log_b a_1 + \log_b a_2$

$\log_b(a_1 / a_2) = \log_b a_1 - \log_b a_2$

$\log_b(a^k) = k \log_b a$

$\log_{b^k} a = \frac{1}{k} \log_b a$

$\log_b a = \frac{\log_c a}{\log_c b} \rightarrow \log_b a = \frac{\log_a a}{\log_a b} = \frac{1}{\log_a b}$

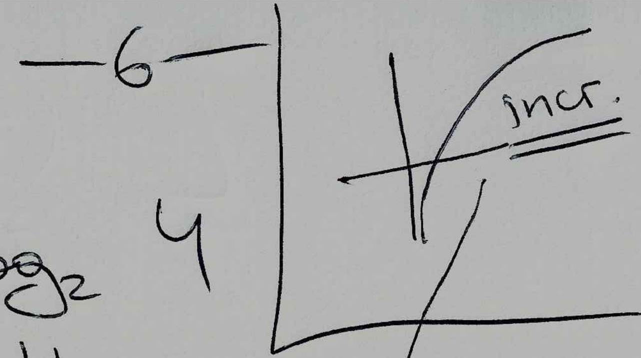
$\underline{\cancel{\log} \log_b \cancel{z}\, n} = \frac{\log_{10} n}{\log_{10} b} = \underbrace{\log_b 10}_{\text{constant}} \underline{\underline{\log_{10} n}}$

$O(\log_b n) = O(\underbrace{\underline{\underline{\log n}}}_{\text{no base}})$

$\log n$

base 10

$\log_2 3$?



$$\log_2 2 < \log_2 3 < \log_2 4$$

$$\begin{array}{ccccc} \shortparallel & & & & \shortparallel \\ 1 & < & \log_2 3 & < & 2 \end{array}$$

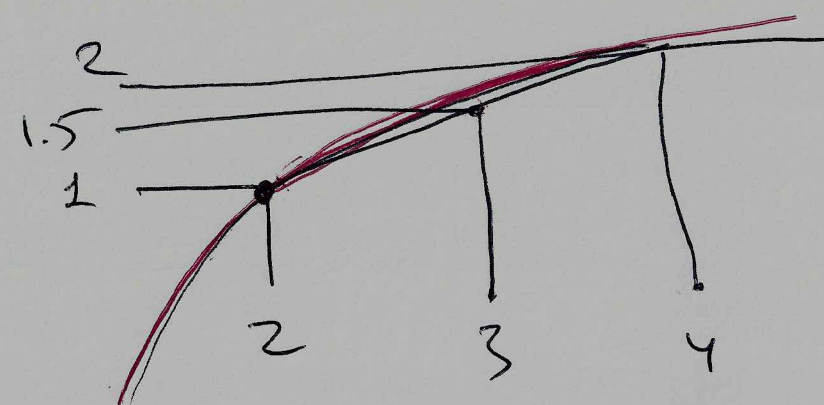
✓ log is "convex up"

1.5 ?

"~~close~~" = "~~approx~~"

"less than"

"greater than"



$$\log_2 3 \approx 1.58$$

log x slowest growing "named" func.

$$O(\log n) < O(\sqrt[5]{n}) < O(\sqrt{n})$$

$$3^{\log_2 n} = 3^{\frac{\log_3 n}{\log_3 2}} = \left[\, x^{a/b} = (x^a)^{1/b} \,\right]$$

$$= \left(3^{\log_3 n}\right)^{1/\log_3 2} =$$

$$= n^{\log_2 3}$$ (faster n^2, slower than linear)