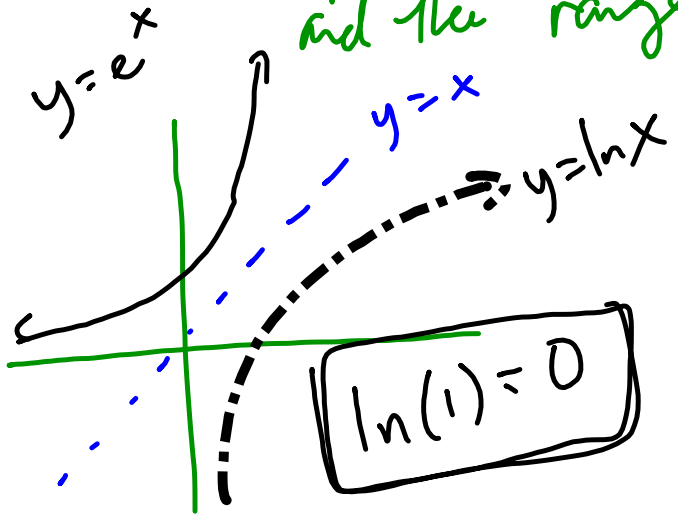
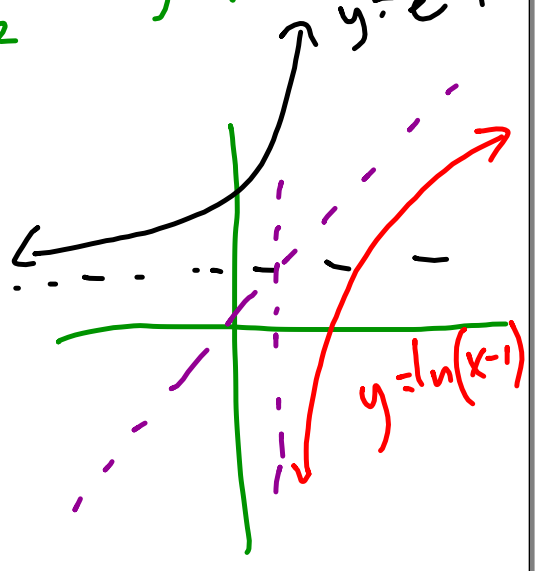
Logs + Exponentials Review

log: $y = \log_b x$ $\Leftrightarrow$ $b^y = x$

exponential: $b^x = y$

Knowing these are inverses helps understand the graph, domain and the range





Properties:

(i) $\ln e^x = x$, $\log 10^x = x$

or $e^{\ln x} = x$ $\quad 10^{\log x} = x$

(ii) $\ln(AB) = \ln A + \ln B$

(iib) $\ln\left(\frac{A}{B}\right) = \ln A - \ln B$

$\ln\left(A \cdot B^{-1}\right) = \ln A + \ln\left(B^{-1}\right)$

$= \ln A - \ln B$

note: $\ln(A+B) - \ln\left(A^{-1} + B^{-1}\right)$

$= \ln\left(\frac{A+B}{A^{-1}+B^{-1}}\right) = \ln\left(\frac{A+B}{\frac{1}{A}+\frac{1}{B}}\right)$

$= \ln\left(\frac{A+B}{\frac{B+A}{AB}}\right) = \ln(AB)$

(iii) $\ln(x^b) = b \ln x$

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using logs / logarithmic scale

2b $\quad e^{(x+5)} = 7 \cdot 2^x$

$x+5 = \ln(7 \cdot 2^x)$

$x+5 = \ln 7 + \ln 2^x$

$x+5 = \ln 7 + x \ln 2$

$x - x\ln 2 = \ln 7 - 5$

$x(1 - \ln 2) = \ln 7 - 5$

$x = \frac{\ln 7 - 5}{1 - \ln 2} = -9.95$