Lesson 4 Logs with Special Bases

The most important base number for exponential functions is the value denoted by *e*.
Like π, *e* (Euler's number) is an irrational number whose value is 2.718281828347045…

Evaluating Logarithms

Base 10

- $y = \log_{10} x$ is called a common logarithmic function
- also written as $y = \log x$

Base *e*

- the inverse of the natural exponential function $y = e^x$ is $y = \log_e x$ which is more commonly written as $y = \ln x$ (natural logarithm)

  * pronounced "lon" *x*

Ex.1) Use your calculator to evaluate the following logs.

a) $\log 100$ b) $\log \frac{1}{10}$ c) $\ln 100$

d) $\ln e^3$ e) $\ln 1$ f) $\ln e^7$

g) $\log 0$ h) $\log 1$ i) $\ln e$

Ex. 2) Use your calculator to evaluate the inverse logarithm. (ie. Solve for *x*)

a) $\log x = 5$ b) $ln_e x = -0.3$

*The calculator is only useful for base 10 and base *e* (special bases). For non-special bases we use exponential form or change of base formula.

Change of Base Theorem

$$log_b n = \frac{log_a n}{log_a b} \quad where\ a, b\ and\ n > 0, a \neq 1, b \neq 1$$

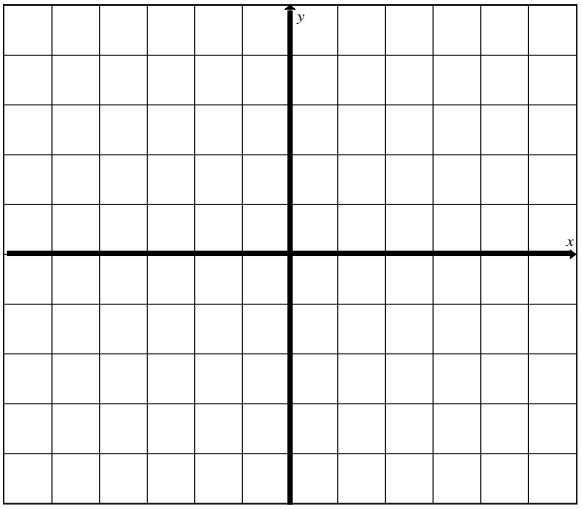
Ex. 3) Evaluate the following.

a) $y = \log_2 3$

b) $y = \log_7 \pi$

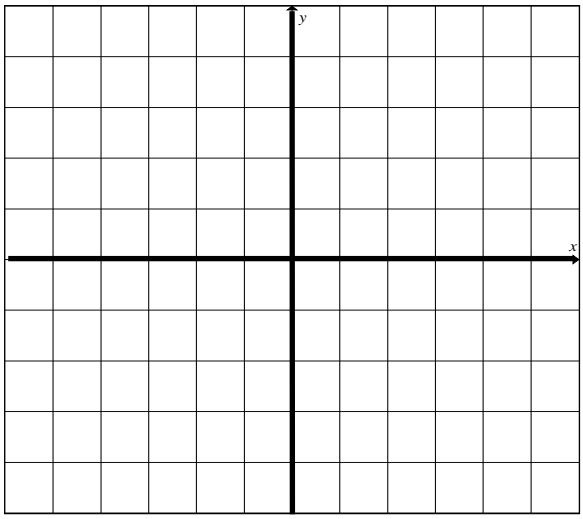
Sketching $y = e^x$ and $y = \ln x$

Ex. 1) Sketch the graph of $y = e^x$.

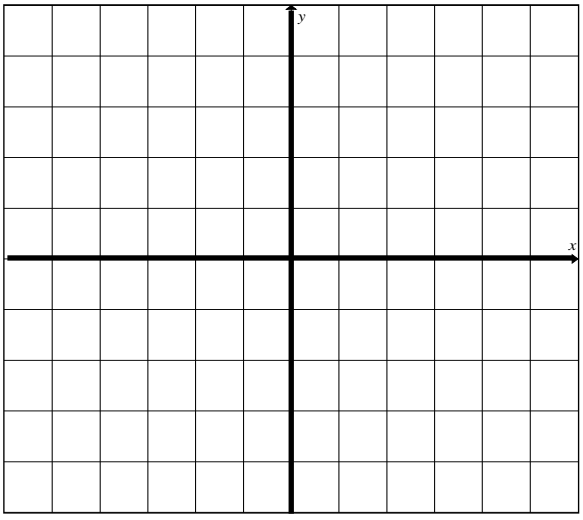


Ex. 2) Sketch the graph of $y = \ln x$.

- The inverse of $y = e^x$ *is* $y = \log_e x$
- More commonly written as $y = \ln x$



Ex. 3) Sketch the graph of $y = -e^x - 2$.



Assignment: Sketch the graph of: 1.) $y = -e^{-x+1}$, 2.) $y = \ln(-x) + 1$, 3.) $y = 2e^{(x-1)}$, 4.) $y = -\ln(-x + 2)$