Quiz 8 Review

Terminology

$f(x) = \ldots\ldots$

"Argument"

- Properties of exponentials & logs

	$\ln(x)$	e^x
1)	$\ln(b^a) = a \cdot \ln(b)$	$(e^b)^a = e^{b \cdot a}$
2)	$\ln(ab) = \ln(a) + \ln(b)$	$e^a e^b = e^{a+b}$
3)	$\ln(a+b) =$ nothing!	$e^a + e^b =$ nothing!

Remember: e^x is a function

$f(x) = e^x$

Common mistake: Eg scaling

① Stretch by 4, then
② Translate right by 3
③ Stretch vertically by 10

$f_0(x) = e^x$

$\Rightarrow f_1(x) = f_0(\frac{1}{4}x) = e^{\frac{1}{4}x}$

$\Rightarrow f_2(x) = f_1(x-3) = e^{\frac{1}{4}(x-3)}$

$\Rightarrow f_3(x) = 10 \cdot f_2(x) = 10e^{\frac{1}{4}(x-3)}$

$\boxed{\Rightarrow f_3(x) = 10e^{\frac{1}{4}(x-3)}}$

Common mista: $f_1(x) = \frac{1}{4}e^x$ or $f_1(x) = e^{4x}$ ⚠

Common mistake: $f_2(x) = e^{\frac{1}{4}x-3}$ ↩ $e^{\frac{1}{4}(\cdot)}$

Properties

- $e^{\ln(?)} = ?$

- $\ln(e^{?}) = (?)\ln(e)$ (entire argument!)

  $= ?$ ($\ln(e) = 1$)

- $\log_b(b) = 1$

  ↳ $\log_b(x) = y \iff b^{\log_b(x)} = b^y$

  $\iff x = b^y$ (argument)

- Doing a problem

$\Rightarrow a = b$	$\Rightarrow a = b$
$\Rightarrow \ln(a) = \ln(b)$	$\Rightarrow e^a = e^b$
$\Rightarrow$	$\Rightarrow$

New tools

Solve for x

Eg 1 $e^{5\ln(x)} = e^{\ln(x^5)} = x^5$

Eg 1.b $e^{\alpha\ln(x+\beta)} = e^{\ln((x+\beta)^\alpha)} = (x+\beta)^\alpha$

Eg 2 $\ln(e^{5x}) = (5x)\underbrace{\ln(e)}_{=1} = 5x$

Eg. 2.b $\ln(\alpha e^{\beta x+\gamma}) = \ln(\alpha) + \ln(e^{\beta x+\gamma})$

$= \ln(\alpha) + (\beta x+\gamma)\underbrace{\ln(e)}_{=1} = \ln(\alpha) + \beta x + \gamma$

- Always include the base of the log!
- "Power rule"

$$\left(a\log(b) = \log(b^a)\right)$$

Always raise the entire argument to the a^{th} power

$$10^{\alpha \log_{10}(x) - \beta \log_{10}(x^2+1)}$$

$$= 10^{\alpha \log_{10}(x)} \cdot 10^{-(\beta \log_{10}(x^2+1))}$$

$$= 10^{\alpha \log_{10}(x)} \cdot 10^{-\beta \log_{10}(x^2+1)}$$

$$= 10^{\log_{10}(x^\alpha)} \cdot 10^{\log_{10}((x^2+1)^{-\beta})}$$

$$= (x^\alpha) \cdot ((x^2+1)^{-\beta})$$

$$= \frac{x^\alpha}{(x^2+1)^\beta}.$$

Ex Simplify

$$\left[-2x^2t^3(z+\ell)^2\right]^{-2}\left(\frac{z^3}{x}\right)$$

$$= \left[(-1)^{-2} \cdot (2)^{-2} \cdot (x^2)^{-2} \cdot (t^3)^{-2} \cdot ((z+\ell)^2)^{-2}\right]\left(\frac{z^3}{x}\right)$$

$$= \left[1 \cdot 2^{-2} \cdot x^{-4} \cdot t^{-6} \cdot (z+\ell)^{-4}\right] z^3 \cdot x^{-1}$$

$$= x^{-5} \cdot 2^{-2} \cdot t^{-6} \cdot z^3 \cdot (z+\ell)^{-4}$$

$$= \frac{z^3}{4 \cdot x^5 \cdot t^6 (z+\ell)^4}.$$

⚠ Refer to the notes during Quizzes!

Project 1 Outline

$A(m,t) = m \cdot e^{c(t-270)}$ $\quad c = ?$, $b = ?$

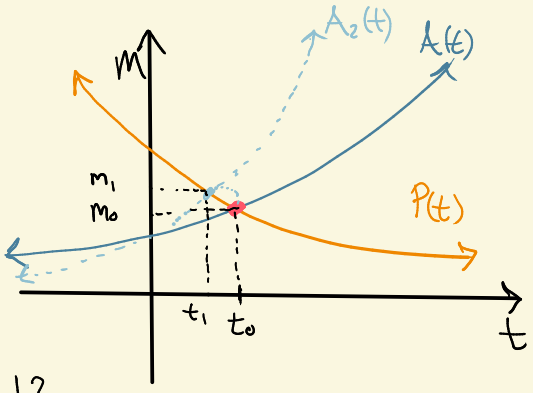
$P(m,t) = 3m^2 e^{-b(t-270)}$

Goal 1: $A(m,t) = P(m,t)$

By plugging A, P values (fixed)

Goal 2: How does this intersection change when the parameters are changed?

↳ A, P, b, c



① $P(m,t) \rightsquigarrow$ Solve for m by setting $P = \text{const}$

$A(m,t) \rightsquigarrow$ " m

② $A(m,t) = m = P(m,t) \rightsquigarrow$ Intersection

③ Changing params

param c

Δc	Δt	Δm
$\pm 1\%$	?	?
$\pm 5\%$	?	?
⋮	⋮	⋮