4.4a
1

4.4: Log & Ln.

How do I calculate $\log_{2.678}(4.123)$?

Derive the change of base formula.

Let $y = \log_b(a)$

$\iff b^y = a$

$\iff \log_c(b^y) = \log_c(a)$

$\iff y\log_c(b) = \log_c(a)$

$\iff y = \dfrac{\log_c(a)}{\log_c(b)}$

So $\log_b(a) = \dfrac{\log_c(a)}{\log_c(b)} = \dfrac{\log(a)}{\log(b)} = \dfrac{\ln(a)}{\ln(b)}$.

Find $\log_{2.678}(4.123)$.

4.4a
2/

Ex: Population Data

consider the exp $y = a \cdot b^x$, $a, b > 0$ & $b \neq 1$.

$$a = 10^{\log(a)}$$

$$b = 10^{\log(b)}$$

$$y = \left(10^{\log(a)}\right) \cdot \left(10^{\log(b)}\right)^x$$

$$y = 10^{\log(a)} \cdot 10^{x\log(b)}$$

$$y = 10^{\log(b)x + \log(a)}.$$

call $M = \log(b)$

$B = \log(a)$

so $y = 10^{Mx + B}$

or $a \cdot b^x = 10^{Mx + B}$

we have what appears to be exponential data.

$$y = 10^{mx + B}$$

$\Rightarrow \underbrace{\log(y)}_{\Upsilon} = mx + B$ ← our linear model

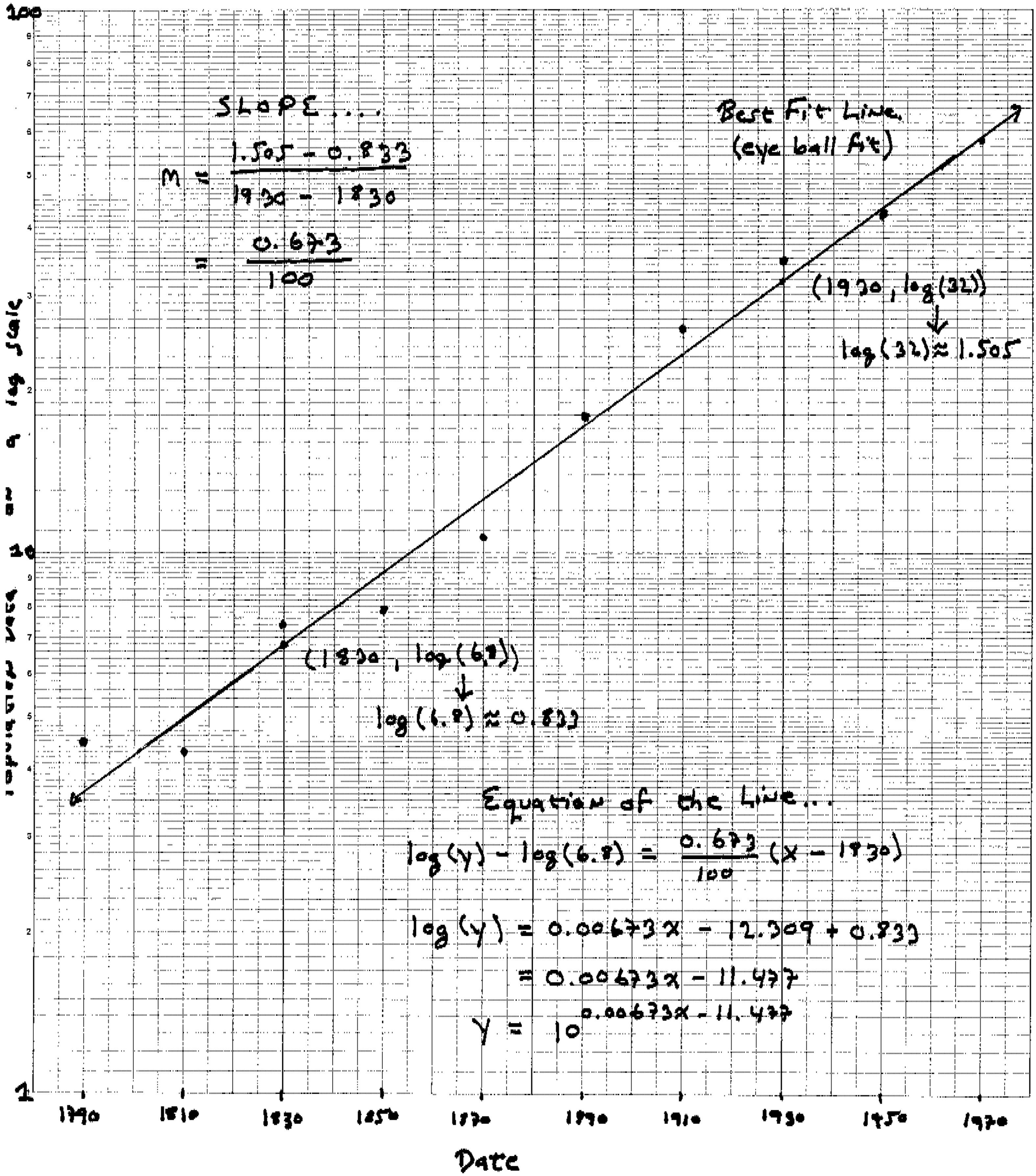
$\Rightarrow \Upsilon = mx + B$ ← a line in (x, Υ) or $(x, \log(y))$

$\Rightarrow \Upsilon \approx 0.00673x - 11.477$

$\Rightarrow \log(y) \approx 0.00673x - 11.477$

$\Rightarrow y = 10^{0.00673x - 11.477}$ ← exponential model.

Semi-Log Paper – For Exponential Curve Fitting



SEMI-LOG PAPER: FOR EXP CURVE FITTING.