i. Find the normal eqns for $x = \alpha y + \beta$, by using least-square approximation.

$$S = \sum (X_i - \alpha y_i - \beta)^2 \quad \begin{cases} \dfrac{\partial S}{\partial \alpha} = 0 = \sum 2(X_i - \alpha y_i - \beta)(-y_i) \\[2mm] \dfrac{\partial S}{\partial \beta} = 0 = \sum 2(X_i - \alpha y_i - \beta)(-1) \end{cases}$$

then so-called normal eqns

$$\Rightarrow \boxed{\begin{aligned} \alpha \sum y_i^2 + \beta \sum y_i &= \sum X_i y_i \\ \alpha \sum y_i + bN &= \sum X_i \end{aligned}}$$

ii. Find the normal eqns for $y = a x^b$, by using least-square approximation

$$\ln y = \ln a + b \ln x \longrightarrow Y = A + bX$$

$$S = \sum (Y - A - bX)^2 \quad \begin{cases} \dfrac{\partial S}{\partial A} = 0 \\[2mm] \dfrac{\partial S}{\partial b} = 0 \end{cases}$$

$$\Rightarrow \boxed{\begin{aligned} b \sum X_i^2 + A \sum X_i &= \sum X_i Y_i \\ b \sum X_i + AN &= \sum Y_i \end{aligned}}$$