2. 1で $x_i' = x_i - \bar{x}$, $y_i' = y_i - \bar{y}$ とおくと.

$\overline{x'} = 0$, $\overline{y'} = 0$.

$$\overline{x'^2} = \frac{1}{N}\sum_{i=1}^{N}(x_i - \bar{x})^2 = \overline{x^2} - \bar{x}^2$$

$$\overline{x'y'} = \frac{1}{N}\sum_{i=1}^{N}(x_i - \bar{x})(y_i - \bar{y}) = \overline{xy} - \bar{x}\,\bar{y}.$$

1の結果から $\hat{\beta}_1 = \dfrac{\overline{x'y'}}{\overline{x'^2}} = \dfrac{\overline{x^2} - \bar{x}^2}{\overline{xy} - \bar{x}\,\bar{y}}$.

また、$\bar{y} = \hat{\beta}_0 + \hat{\beta}_1 \bar{x}$ より、

$$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x}.$$