$$\frac{1}{2} \times \mathbb{N}(\underline{X}\underline{P}, \underline{Z}) \qquad \underline{Y} = \begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix} \underline{P} = \begin{pmatrix} p_1 \\ p_2 \\ p_3 \\ p_4 + p_1 \end{pmatrix}$$

$$\frac{X}{2} = \begin{pmatrix} 1 & X_{11} & X_{21} & \dots & X_{k_1} \\ 1 & X_{12} & X_{22} & \dots & X_{k_2} \\ 1 & X_{13} & X_{23} & \dots & X_{k_N} \end{pmatrix}$$

$$\frac{X}{2} = \begin{pmatrix} 1 & X_{11} & X_{21} & \dots & X_{k_1} \\ 1 & X_{12} & X_{22} & \dots & X_{k_N} \\ 1 & X_{13} & X_{23} & \dots & X_{k_N} \end{pmatrix}$$

$$\frac{X}{2} = \begin{pmatrix} 1 & X_{11} & X_{21} & \dots & X_{k_N} \\ 1 & X_{12} & X_{22} & \dots & X_{k_N} \\ 1 & X_{13} & X_{23} & \dots & X_{k_N} \end{pmatrix}$$

$$= -2 \begin{pmatrix} 1 & 0 \\ 0 & \dots & 0 \\ 0 & \dots & 0 \end{pmatrix}$$

$$\left(\begin{array}{c} \left(\begin{array}{c} Y_{1}Y_{1}P_{1}\Sigma\right) = -\frac{N}{2} \log_{3} 2T - \frac{1}{2} \log_{3} \left(\frac{1}{2} + \left(\frac{1}{2}\right)\right) - \frac{1}{2} \left(\begin{array}{c} Y_{1} \times P_{1} \end{array}\right) \left(\begin{array}{c} Y_{1} \times P_{1} \end{array}\right) \\
\times -\frac{1}{2} \log_{3} \left(\frac{1}{2} + \left(\begin{array}{c} O^{2}II \end{array}\right) - \frac{1}{2} \left(\begin{array}{c} Y_{2} \times P_{1} \end{array}\right) \left(\begin{array}{c} Y_{1} \times P_{1} \end{array}\right) \\
\times -\frac{1}{2} \log_{3} \left(\begin{array}{c} O^{2} \end{array}\right)^{2} - \frac{1}{2\sigma^{2}} \left(\begin{array}{c} Y_{2} \times P_{1} \end{array}\right) \left(\begin{array}{c} Y_{2} \times P_{1} \end{array}\right) \left(\begin{array}{c} Y_{2} \times P_{1} \end{array}\right)$$

$$\times \left(\begin{array}{c} O(1) \\ O(2) \end{array}\right) = \frac{1}{2\sigma^{2}} \left(\begin{array}{c} Y_{2} \times P_{1} \end{array}\right) \left(\begin{array}{c} Y_{2} \times P_{1} \end{array}\right) \left(\begin{array}{c} Y_{2} \times P_{1} \end{array}\right)$$

$$\times \left(\begin{array}{c} O(2) \\ O(2) \end{array}\right) = \frac{1}{2\sigma^{2}} \left(\begin{array}{c} Y_{2} \times P_{1} \end{array}\right) \left(\begin{array}{c} Y_{2} \times P_{1} \end{array}\right) \left(\begin{array}{c} Y_{2} \times P_{1} \end{array}\right)$$

$$\frac{\partial}{\partial x} = -\frac{1}{2\sigma^2} \frac{\partial}{\partial \rho} \left[ (y - x\rho)^{\dagger} (y - x\rho) \right]$$

$$= \frac{1}{2\sigma^2} \frac{\partial}{\partial \rho} \left[ (y - x\rho)^{\dagger} (y - x\rho)^{\dagger} (y - x\rho) \right]$$

$$= \frac{1}{2\sigma^2} \frac{\partial}{\partial \rho} \left[ (y - x\rho)^{\dagger} (y - x\rho)^{\dagger} (y - x\rho) \right]$$

= \frac{1}{8} \left[ -\frac{1}{8} \text{ xy + } \frac{1}{8} \text{ x} \text{ } \right] = 0

$$-x^{\prime}y + x^{\prime}x \beta = 0$$

$$x' \times \rho = x' \times \gamma$$

$$(x' \times)^{-1} (x' \times) \rho = (x' \times)^{-1} (x' \times)$$

$$\hat{\rho} = (x' \times)^{-1} x' \times \gamma$$

$$\frac{\int \ell(\cdot)}{\int \sigma^{2}} = -\frac{1}{2} \frac{1}{\sigma^{2}} + \frac{1}{2(\sigma^{2})^{2}} (y - x\rho)'(y - x\rho)$$

$$= \frac{1}{2\sigma^{2}} \left( -n + \frac{1}{\sigma^{2}} (y - x\rho)'(y - x\rho) \right) = 0$$

$$Assumi \int_{-n}^{2} (y - x\rho)'(y - x\rho) = 0$$

 $\ell(\cdot) \propto -\frac{n}{2} \log \sigma^2 - \frac{1}{2\sigma^2} \left( \frac{\chi - \chi P}{\chi} \right)' \left( \frac{\chi - \chi P}{\chi} \right)$ 

$$-n + \frac{1}{\sigma^{2}}(\underline{Y}-\underline{X}\underline{P})'(\underline{Y}-\underline{X}\underline{P}) = 0$$

$$\sigma^{2} = \frac{1}{n}(\underline{Y}-\underline{X}\underline{P})'(\underline{Y}-\underline{X}\underline{P}) = 0$$

$$= \frac{1}{n}(\underline{Y}-\underline{X}\underline{P})'(\underline{Y}-\underline{X}\underline{P}) = \frac{1}{n}\sum_{i=1}^{n}(\underline{Y}_{i}-\underline{Y}_{i})^{2}$$

$$= \frac{1}{n}(\underline{Y}-\underline{Y})'(\underline{Y}-\underline{Y}) = \frac{1}{n}\sum_{i=1}^{n}(\underline{Y}_{i}-\underline{Y}_{i})^{2}$$