Basis for poly:

All poly with degree = 4

$$g(x) = a + bx + cx^2 + dx^3 + ex^4$$

$$h_1(x) = 1, \quad h_2(x) = x, \quad h_3(x) = x^2$$

$$h_4(x) = x^3 \quad h_5(x) = x^4$$

CS: wrt $\{\xi_1, \xi_m\}$ $x \in [a, b]$ $df = m + 4$

NCS: $df = m$

SS $\Longleftrightarrow$ Ridge Regression

$\{x_i, y_i\}_{i=1}^n \qquad g(x) \to y$

$\lambda > 0$

$$\min \left(\sum_{i=1}^{n} [g(x_i) - y_i]^2 + \lambda \int_a^b [g''(x)]^2 \, dx \right)$$

use $\tilde{g} \in NCS[x_1, \ldots, x_n]$ only

need to parameterized with n coefficients

- Recall LOO-CV

OLS $y \sim \beta X + \varepsilon \qquad \beta^{[-i]} \to$ OLS coeffs based on n-1 observations where we leave ith observation out

LOO-res: $\gamma_i^{[-i]} = y_i - x_i^T \beta^{[-i]}$

$$= \frac{y_i - x_i^T \hat{\beta}}{1 - H_{ii}} \qquad H = X(X^TX)^{-1}X^T$$

$H_{n \times n}$