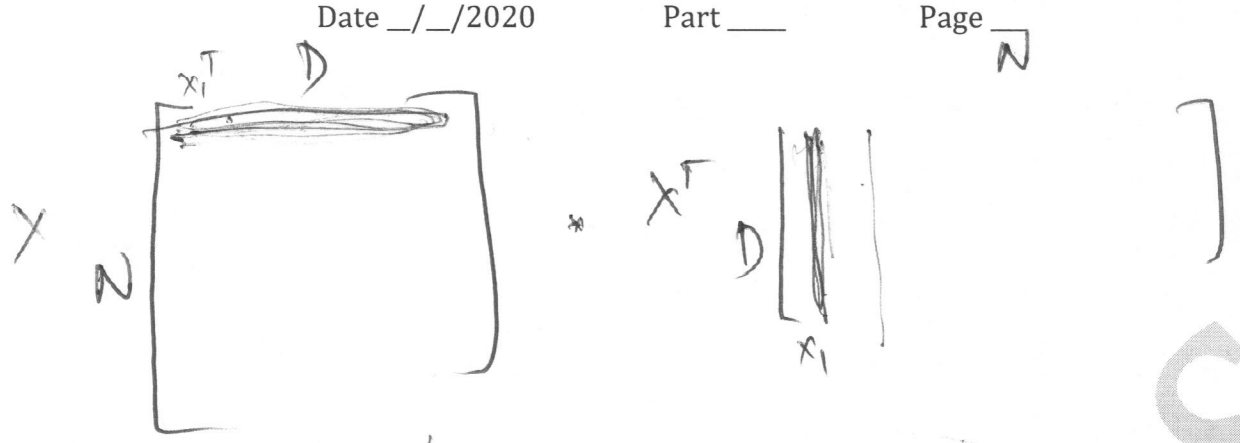

XX^T

$x_1^T x_1$ $x_2^T x_1$ ...

K

$k(x_1, x_1)$ $k(x_1, x_2)$ ...

let $x_1, x_2, x_3 \cdots x_N$ be in $\mathbb{R}^2$

$x_1 \rightarrow (x_{11}, x_{12})$

$x_2 \rightarrow (x_{21}, x_{22})$

Let basis fns be: $x_i \rightarrow (x_{i1}, x_{i2})$

x_{i1}^2, x_{i2}^2, $(x_{i1}^2 + x_{i2}^2)$

$\Phi_1 \rightarrow x_{11}^2, x_{12}^2, x_{11}^2 + x_{12}^2$

$\Phi_2 \rightarrow$ — — —

$$\Phi_i^T \Phi_j = [x_{i_1}^2, x_{i_2}^2, (x_{i_1}^2 + x_{i_2}^2)] \begin{bmatrix} x_{j_1}^2 \\ x_{j_2}^2 \\ x_{j_1}^2 + x_{j_2}^2 \end{bmatrix}$$

$$k(x_i, x_j) = \left(x_{i_1}^2 x_{j_1}^2 + x_{i_2}^2 x_{j_2}^2 + \cdots \right)$$

RBF Kernel

$$k(x_i, x_j) = \exp\left(-\frac{1}{2\gamma^2} \|x_i - x_j\|^2 \right)$$

Assume $\gamma = 1$ and $D = 1$

$$k(x_i, x_j) = \exp\left(-\frac{1}{2}(x_i - x_j)^2 \right) \quad \text{ignoring } \tfrac{1}{2} \text{ for now}$$

$$= \exp\left(-x_i^2 - x_j^2 + 2 x_i x_j \right)$$

$$= \exp(-x_i^2) \exp(-x_j^2) \exp(2 x_i x_j)$$