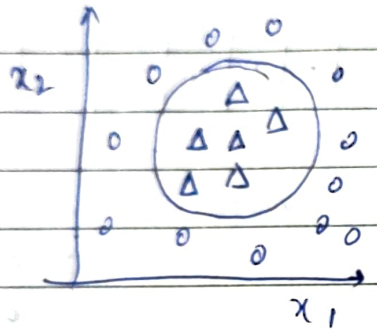
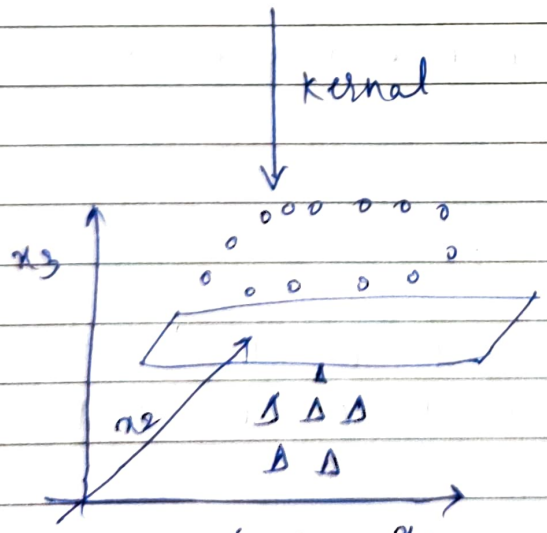
SVM Kernel →

Kernel function generally transforms the training set of data so that a non-linear decision surface can be transformed to a linear eqⁿ in a higher no. of dimension spaces. It returns the inner product between two points in a standard feature dimension.



not linearly seperable

SVM in 2 dimension



SVM in 3 dimensions

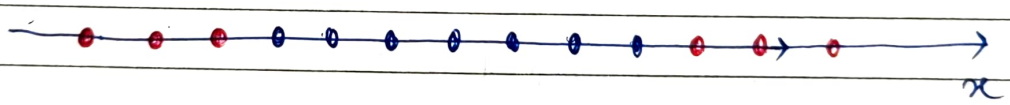
Types of SVM Kernel –

1. Linear Kernel
2. Polynomial Kernal
3. Radial Basis Function (RBF) Kernel
4. Sigmoid Kernel

Eg.

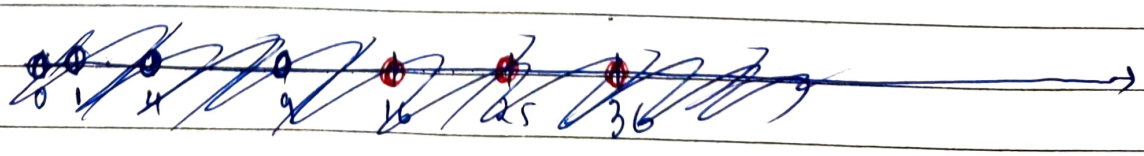
Feature (x)	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6

lets say dataset has only one feature (x). It has two classes → lets say Red color values – class 1
Blue ——————— 2

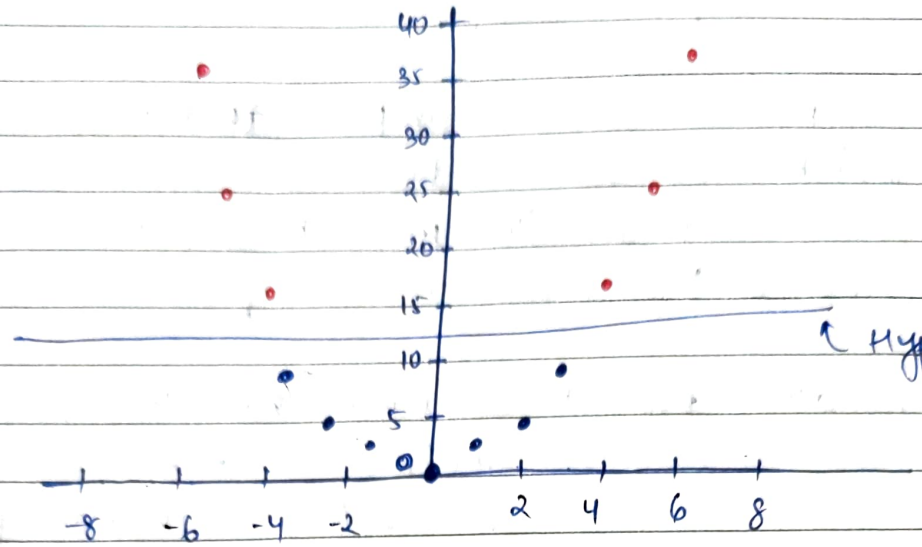


Here, we can't seperate two types of classes. So, If I create a new feature x^2

x	-6	-5	-4	3	2	1	0	1	2	3	4	5	6
x^2	36	25	16	9	4	1	0	1	4	9	16	25	36



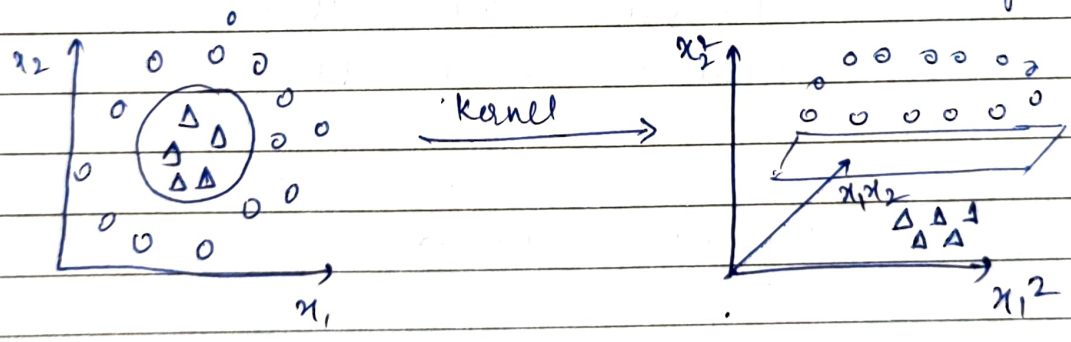
x Vs x^2



① Linear Kernel: $K(x_1, x_2) = x_1^T x_2$

② Polynomial Kernal: $K(x_1, x_2) = (x_1^T x_2 + r)^d$

d = ~~dimension~~ degree of polynomial



③ Radial Basis Kernel

$K(x_1, x_2) = \exp(-\gamma \cdot \|x_1 - x_2\|^2)$

④ Sigmoid kernel

$K(x_1, x_2) = \tanh(\gamma \cdot x_1^T \cdot x_2 + r)$