

# Practice Problems 5

Machine Learning

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Suppose you have 3 data points  $x_1 = (1, 2)$ ,  $x_2 = (3, 1)$  and  $x_3 = (0, 1)$  and a kernel function  $k(x, y) = (\langle x, y \rangle + 2)^2$

1. What is the dimension of the feature space  $F$  induced by the kernel, and what is the kernel-induced function  $\Phi : X \rightarrow F$  ?
2. Calculate  $\langle \Phi(x_1), \Phi(x_2) \rangle_F$  in the feature space.
3. Calculate the distance between all the data points in the feature space.

## References

- [SC04] Shawe-Taylor, J. and Cristianini, N. 2004 Kernel Methods for Pattern Analysis. Cambridge University Press.