Homework:

(1) Sequentially run the following commands in Matlab.
>> RBFCex
>> w
>> c
Indicate the location of the centres in the plot and then determine the formula of resultant RBF classifier.

(2) Find the solution of $\min f(x, y) = x^2 + y - 1$, subject to $x + y \geq 5$.

(3) Verify the results in (2) using quadprog.m function in Matlab.

(4) Supposing $\mathbf{x} = [x_1, x_2]^{\mathrm{T}}$, $\mathbf{y} = [y_1, y_2]^{\mathrm{T}}$, determine the feature map for $K(\mathbf{x}, \mathbf{y}) = (\mathbf{x}^{\mathrm{T}}\mathbf{y} + 1)^2$.

(5) Determine if $K(\mathbf{x}, \mathbf{y}) = (\mathbf{x}^{\mathrm{T}}\mathbf{y} + 1)^2 + \exp(-\|\mathbf{x} - \mathbf{y}\|^2)$ is a kernel.

(6) Consider two class data set

x_1	x_2	t
-1	-1	1
-1	1	-1
1	-1	-1
1	1	1

What is the kernel matrix if $K(\mathbf{x}, \mathbf{y}) = (\mathbf{x}^{\mathrm{T}}\mathbf{y} + 1)^2 + \exp(-\|\mathbf{x} - \mathbf{y}\|^2)$?

(7) For the data set in (5), what is the objective function of support vector machine is dual form in the cases that the kernel is $K(\mathbf{x}, \mathbf{y}) = (\mathbf{x}^{\mathrm{T}}\mathbf{y} + 1)^2$ or $K(\mathbf{x}, \mathbf{y}) = \exp(-\|\mathbf{x} - \mathbf{y}\|^2)$ respectively?