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**ECE 559: Homework 8**

**Q1)**

**Report:**

Code is written in Python (attached at the end of report)

* Input vectors: 100
* Kernel used: Polynomial kernel where K(xi,xj)=(1+xiT.xj)5
* Support vectors found using quadratic optimization: 12

Color codes used in below graphs:

* Class with desired output 1 (Sun and mountain): Red plus
* Class with desired output -1: Black cross
* Hyperplane H where g(x)=0: Blue line made up of dots
* Hyperplane H+ where g(x)=1: Red line made up of dots
* Hyperplane H- where g(x)=-1: Black line made up of dots
* All Support vectors: Green circles

**Observation**:

* I used polynomial kernel with power 5. This is chosen because better separation of classes is observed, as compared to linear SVM or polynomial kernel with power <5
* Hyperplane H clearly separates two classes with none of the vectors on it
* Hyperplane H- has support vectors which belong to class -1
* Hyperplane H+ has support vectors which belong to class 1
* There are no patterns in guard lines (H+ and H-) as well

