1a)

Notice that kernel can be handily integrated into the dual perceptron algorithm. Given the normal dual perceptron algorithm:

2. Repeat
3. For
4. If
6. EndIf
7. EndFor
8. Until k iterations has reached
9. Output

We realize that we could modify the dot product to use the kernel function. In particular, the inequality in line 4 could be changed to:

Then, we have the perceptron training algorithm with kernel:

2. Repeat
3. For
4. If
6. EndIf
7. EndFor
8. Until k iterations has reached
9. Output

To apply the trained model , and given , we simply calculate , and classify the sample as +1 if , and -1 if .