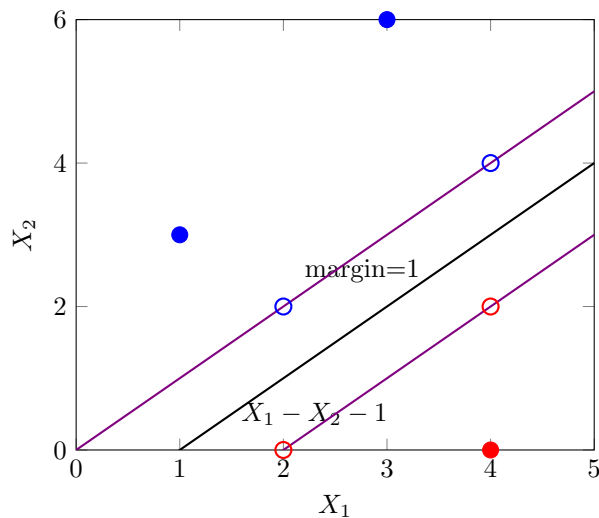


1



a)

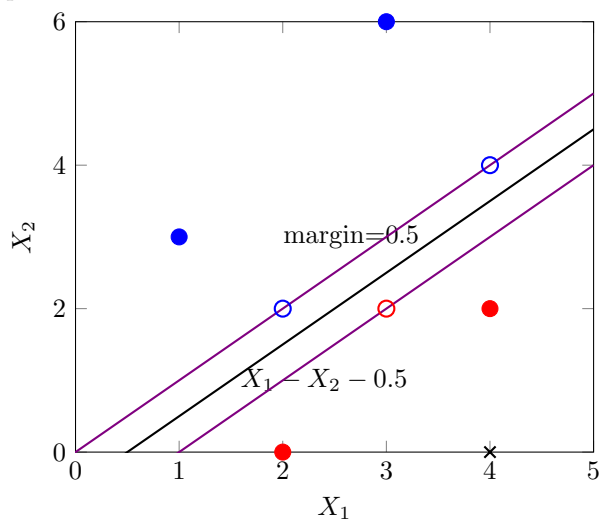
b)

Red :  $X_1 - X_2 - 1 > 0$ ; Blue : otherwise

$$\beta_0 = -1, \beta_{X_1} = 1, \beta_{X_2} = -1$$

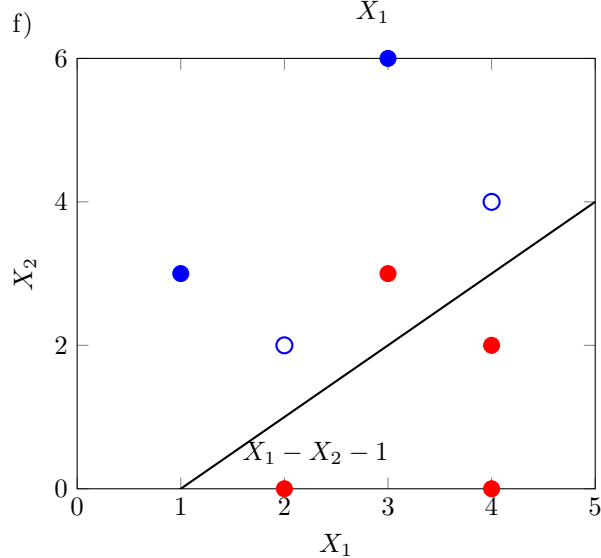
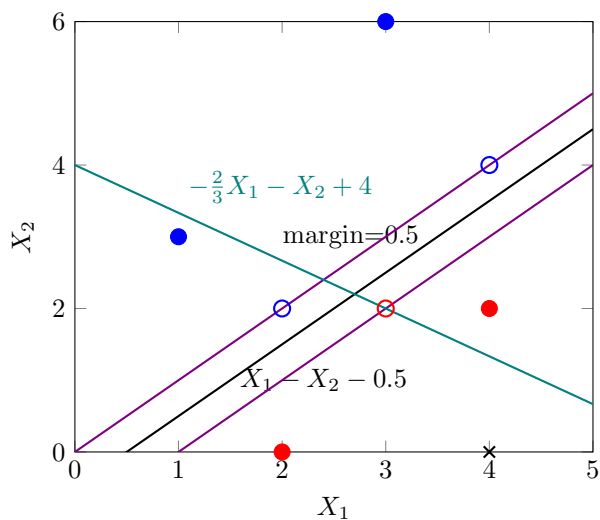
c) margin=1, violet lines

d) support vectors have no fill



e)

moving the point  $(4, 0)$  to  $(3, 2)$  makes it the only red support vector, shifting the hyperplane and shrinking the margin by 0.5.



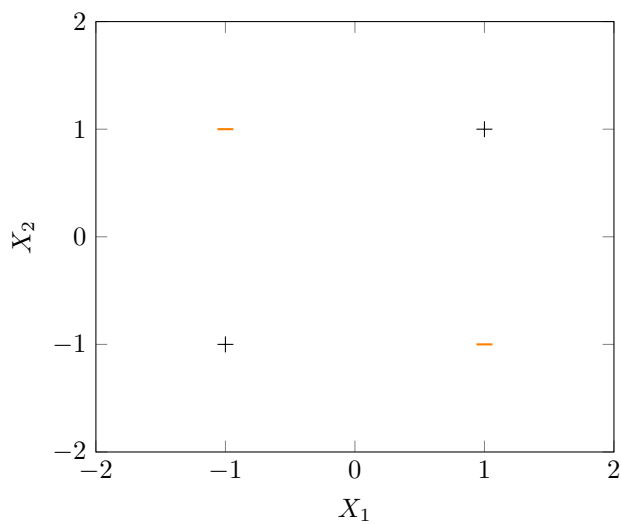
g)  
an additional red datapoint at (3,3) makes this set no longer linearly separable by a hyperplane. The set would require a projection for a new hyperplane to separate the labels.

**2**

a)

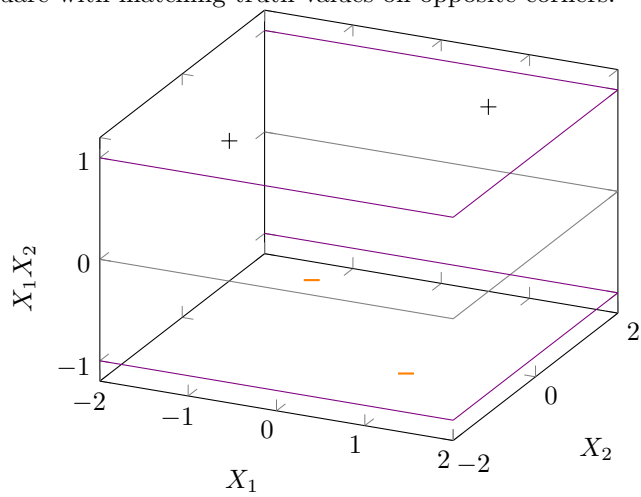
$X_1$	$X_2$	$\neg(X_1 \oplus X_2)$
1	1	+
-1	-1	+
1	-1	-
-1	1	-

a.bonus)  $\neg(X_1 \oplus X_2)$



b)  
square with matching truth values on opposite corners.

Not linearly separable.  $X$  and  $y$  formed a



c)  
plane  $X_1X_2 = 0$

the labels are now linearly separable by the

d) margin=1 and all 4 points are support vectors, being distance=1 from the plane