hw7alex

Question #1a

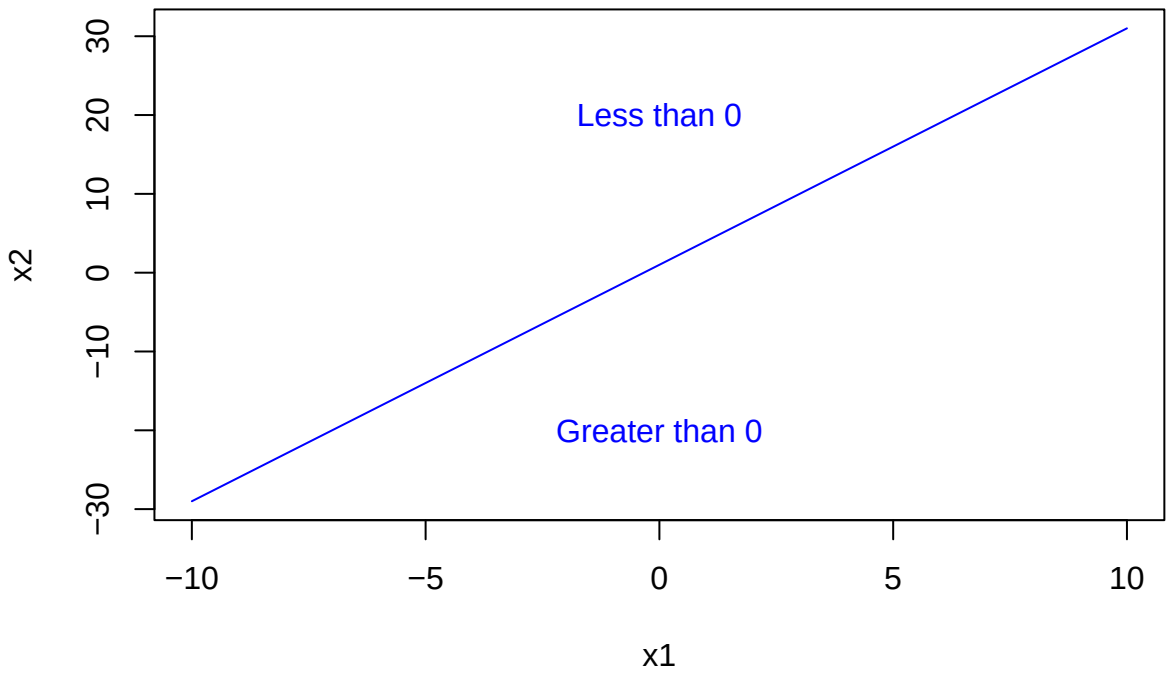
```
options(repos = list(CRAN="http://cran.rstudio.com/"))
install.packages("ggplot2")
```

```
##
## The downloaded binary packages are in
##  /var/folders/ns/yt75j8_1441_wtglyqbys2j40000gn/T//RtmpB0CTnM/downloaded_packages
```

```
install.packages("llatex2exp")
```

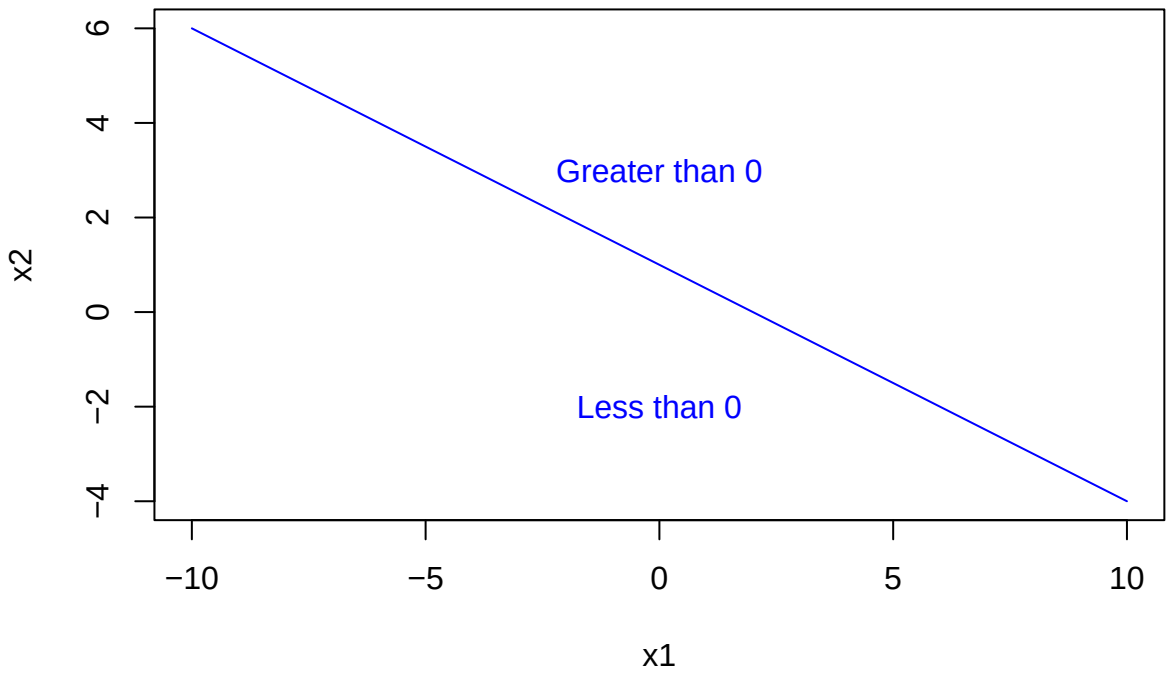
```
## Warning: package 'llatex2exp' is not available for this version of R
##
## A version of this package for your version of R might be available elsewhere,
## see the ideas at
## https://cran.r-project.org/doc/manuals/r-patched/R-admin.html#Installing-packages
```

```
library(ggplot2)
library(latex2exp)

x1 <- -10:10
x2 <- 3*x1 + 1

plot(x1, x2, type = "l", col = "blue")
text(c(0), c(-20), "Greater than 0", col = "blue")
text(c(0), c(20), "Less than 0", col = "blue")
```



Question #1b

```
x1 <- -10:10
x2 <- (-1/2)*x1 + 1

plot(x1, x2, type = "l", col = "blue")
text(c(0), c(3), "Greater than 0", col = "blue")
text(c(0), c(-2), "Less than 0", col = "blue")
```



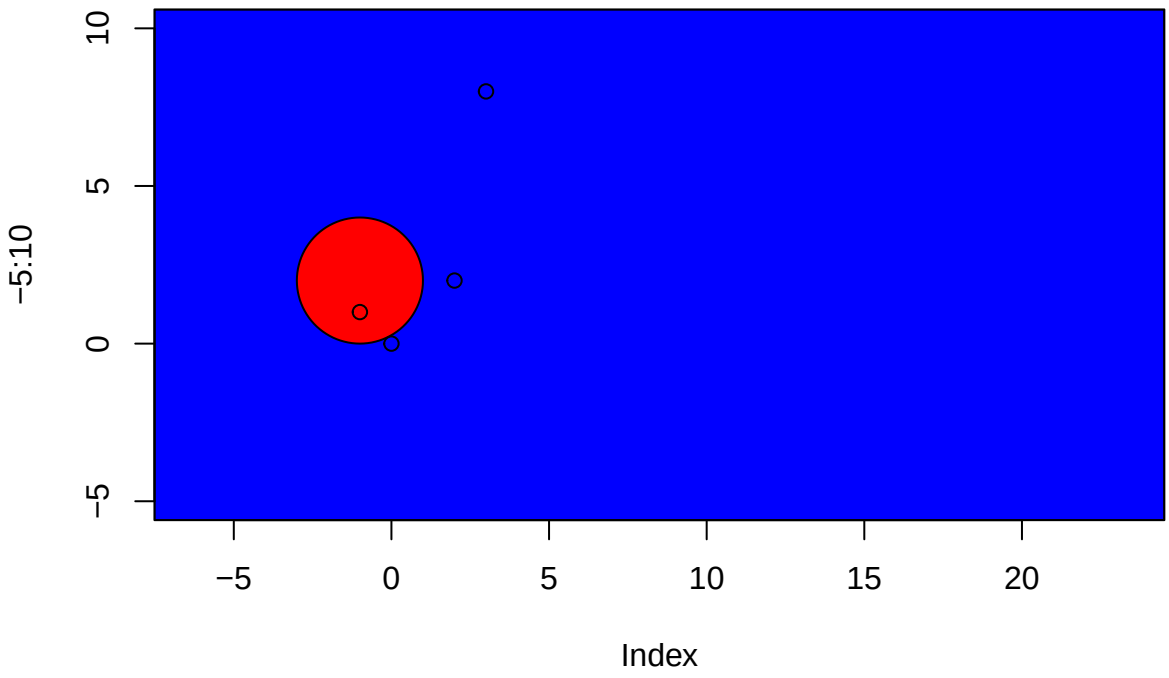
Question #2

(a)

```
install.packages('plotrix')
```

```
##
## The downloaded binary packages are in
##  /var/folders/ns/yt75j8_1441_wtglyqbys2j40000gn/T//RtmpB0CTnM/downloaded_packages
```

```
library(plotrix)
plot.new()
rect(par("usr")[1], par("usr")[3], par("usr")[2],
     par("usr")[4], col="blue")
par(new=TRUE)
plot(-5:10, type="n", asp=1)
draw.circle(-1,2,2, col='red')
points(x = c(0, -1, 2, 3), y = c(0, 1, 2, 8), col = 'black')
```



(b) The blue region is where the set of points would be >4 and the red region is where the set of points would be <= 4.

(c) The points are shown on the plot. (0, 0) is in the blue class. (-1, 1) is in the red class. (2, 2) and (3, 8) are in the blue class.

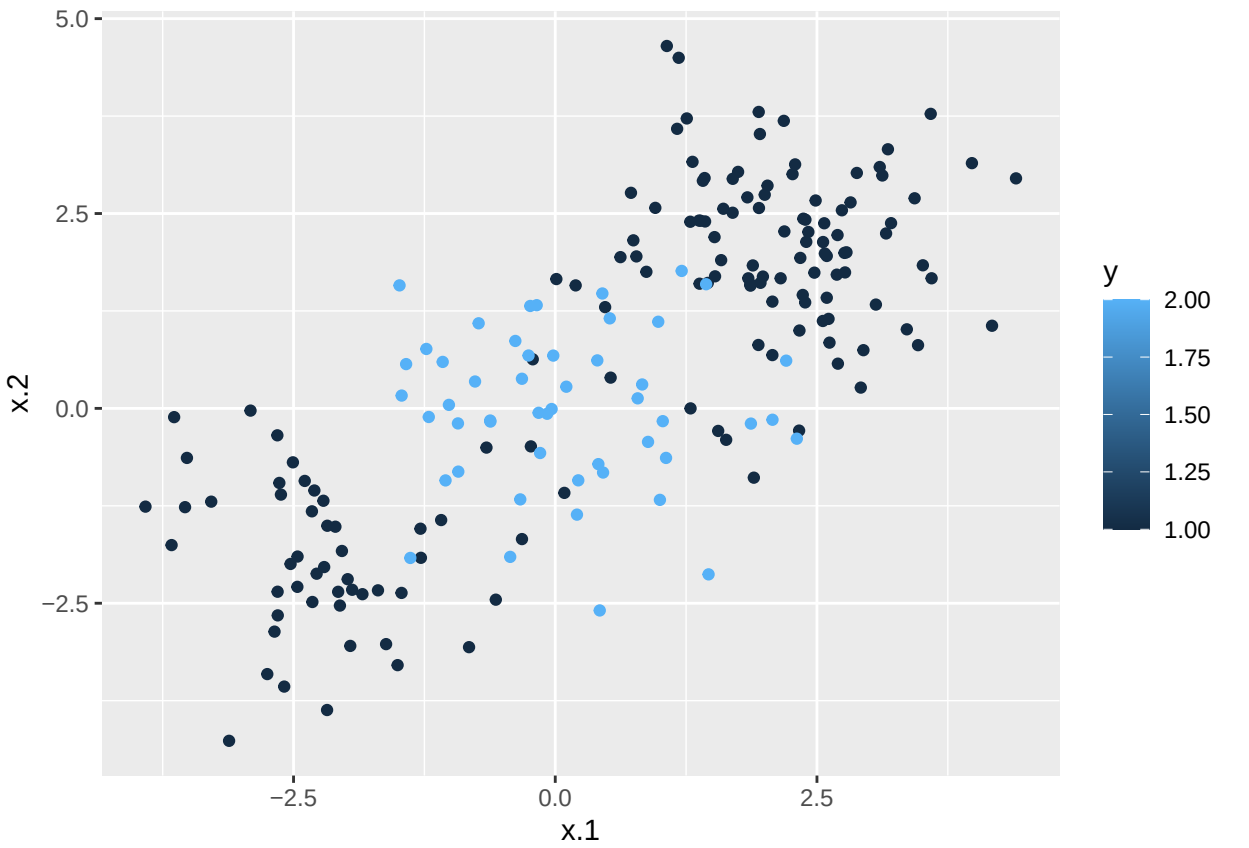
(d) It is linear in terms of X_1, X_1^2, X_2, X_2^2 because the equation could be expanded into $2X_1$ - $4X_2$ + X_1^2 + X_2^2 + 1 = 0 which is linear in terms of the listed variables.

Question #3A

```
train = read.csv("SVM_train.csv")
head(train)
```

```
##   X      x.1        x.2 y
## 1 1 1.373546  2.4094018 1
## 2 2 2.183643  3.6888733 1
## 3 3 1.164371  3.5865884 1
## 4 4 3.595281  1.6690922 1
## 5 5 2.329508 -0.2852355 1
## 6 6 1.179532  4.4976616 1
```

```
library(ggplot2)
ggplot(data=train, aes(x=x.1, y=x.2, color=y))+ geom_point()
```



The class labeled 2 is mostly centered around 0,0 and the other class, 1, is spread out on the upper right and bottom left side of the other class. The two classes are somewhat visually separable, but not perfectly separable: there are points that are almost on top of each othe and would require over fitting to perfectly predict. The decision boundry will definitely not be linear, and closer to a circle.