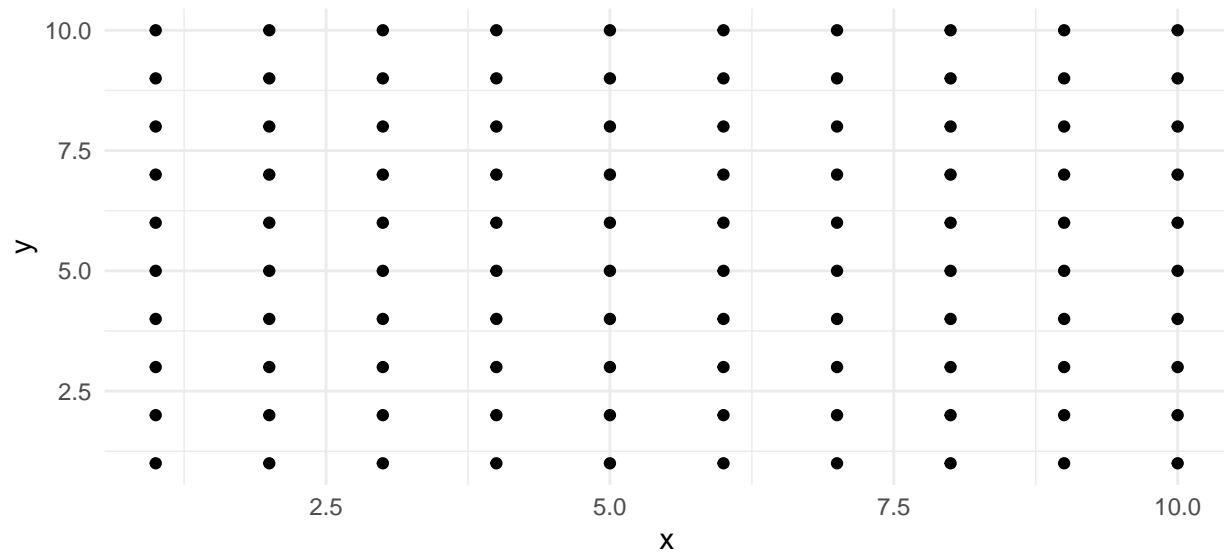


Homework 3

1a.

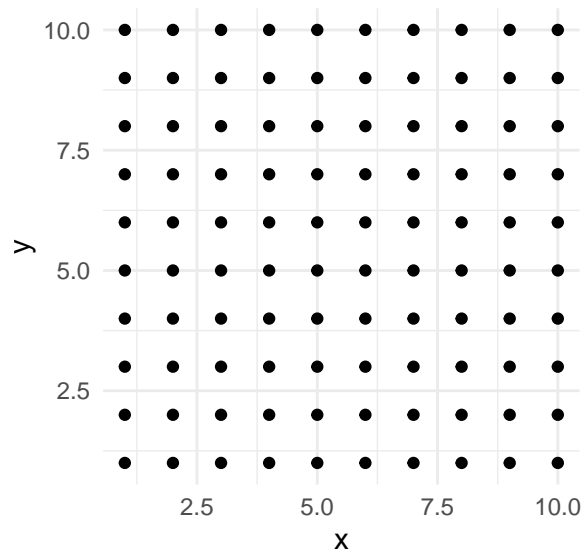
```
library("tidyverse")
```

```
df <- expand_grid("x" = 1:10, "y" = 1:10)  
ggplot(df, aes(x, y)) +  
  geom_point() +  
  theme_minimal()
```



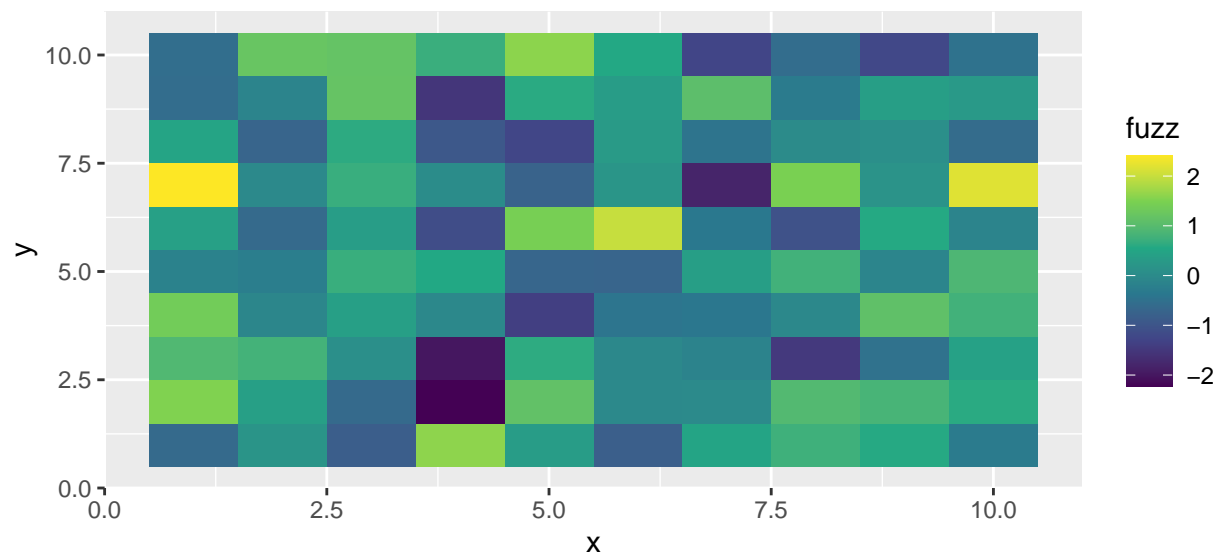
1b.

```
ggplot(df, aes(x, y)) +  
  geom_point() +  
  theme_minimal() +  
  coord_equal()
```



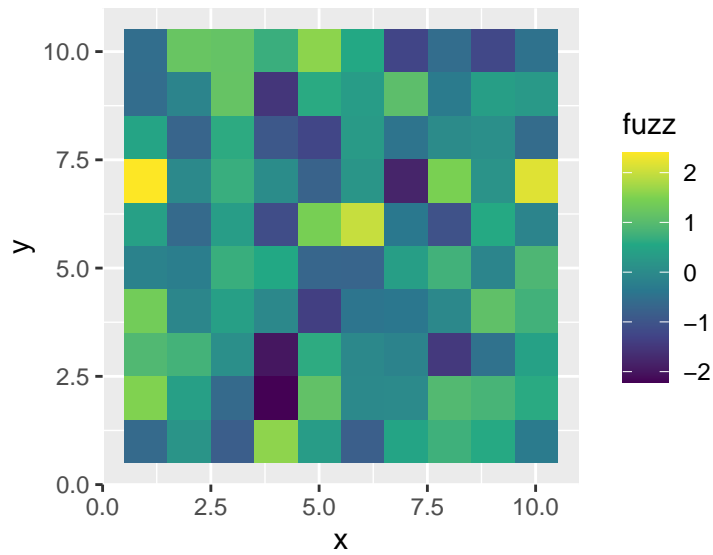
1c.

```
set.seed(1)
fuzz <- rnorm(nrow(df))
ggplot(df, aes(x,y)) + geom_raster(aes(fill=fuzz))
```



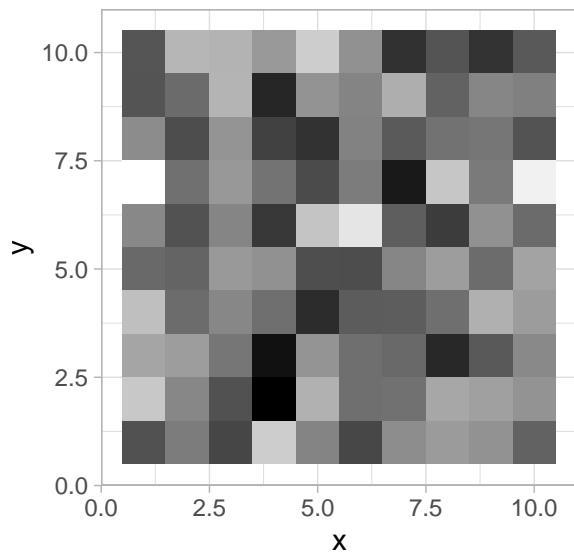
1d.

```
ggplot(df, aes(x,y)) + geom_raster(aes(fill=fuzz)) + coord_equal()
```



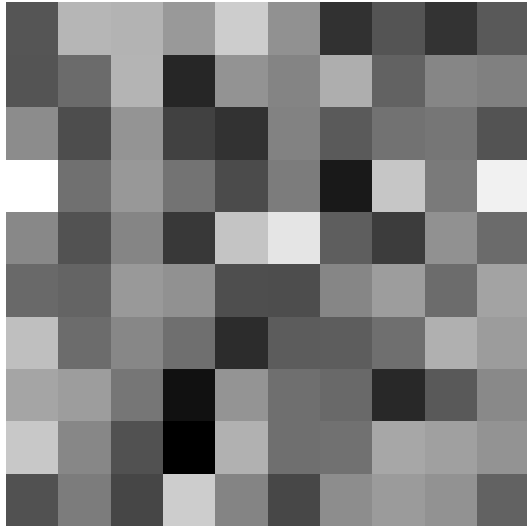
1e

```
#ggplot(df,aes(x,y)) + geom_raster(aes(fill=fuzz)) + scale_fill_gradient2(low="white", high="black") co
ggplot(df, aes(x = x, y = y)) +
  geom_raster(aes(fill = fuzz)) +
  scale_fill_gradient(low = "black", high = "white") +
  coord_equal() +
  theme_light() +
  theme(legend.position = "none")
```



1f.

```
ggplot(df, aes(x = x, y = y)) +
  geom_tile(aes(fill = fuzz)) +
  scale_fill_gradient(low = "black", high = "white") +
  coord_equal() +
  theme_void() +
  theme(legend.position = "none")
```



2a.

```
A <- matrix(c(1,3,2,-7,9,1,-2,2,4), nrow = 3, byrow = TRUE)
ev <- eigen(A)
V <- ev$vectors
L <- ev$values
Lamda <- matrix(c(0,0,0,0,0,0,0,0,0), nrow = 3)
for(i in 1:length(L)){
  Lamda[i,i] <- L[i]
}
V_1 <- solve(V)
A
```

```
#      [,1] [,2] [,3]
# [1,]    1    3    2
# [2,]   -7    9    1
# [3,]   -2    2    4
```

```
V %*% Lamda %*% V_1
```

```
#      [,1] [,2] [,3]
# [1,] 1+0i 3+0i 2-0i
# [2,] -7+0i 9+0i 1-0i
# [3,] -2+0i 2-0i 4-0i
```