02424 Week 1

Exercise 1

Calculate the probability for each of the following events:

a) A standard normally distributed variable is larger than 2.

b) A normally distributed variable with mean 40 and variance equal to 9 is smaller than 34.

c) Getting 9 successes out of 10 trials in a binomial experiment with $p = 0.8$.

d) $X > 6.2$ in a χ^2 distribution with 2 degrees of freedom.

Exercise 2

Consider the observations listed here:

x	y
-1	1.4
0	4.7
1	5.1
2	8.3
3	9.0
4	14.5
5	14.0
6	13.4
7	19.2
8	18

Read the data into R and fit the model using the `lm()` function.

Exercise 3 (possibly difficult)

Use the following observations from a negative binomial distribution.

```
> x <- c(13, 5, 28, 28, 15, 4, 13, 4, 10, 17, 11, 13, 12, 17, 3)
```

R has a function for minimizing functions, which is called `optim()`. It works in the following way:

```
> fun <- function(x) {
+     (x[1] - 3)^2 + x[2]^2
+ }
> fit <- optim(par = c(2, 2), fn = fun)
> fit$par

[1] 2.999923e+00 1.699310e-06
```

Try to use these principles – as well as the likelihood method – to estimate the parameters of the negative binomial distribution