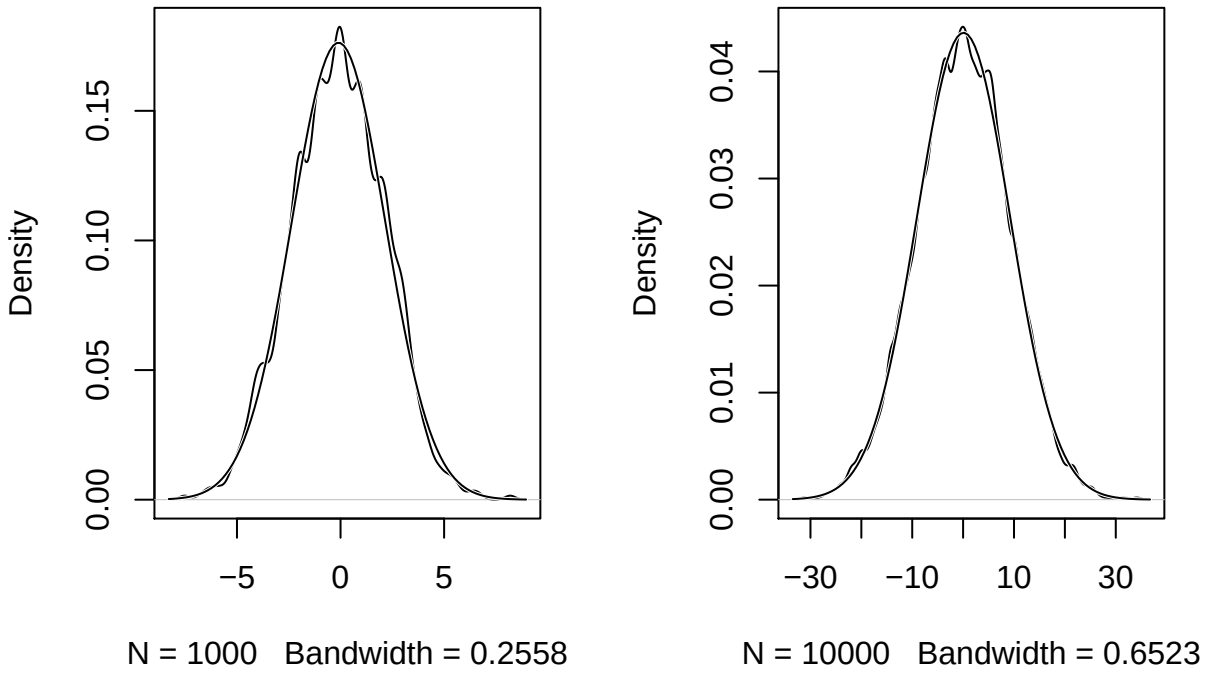
4 - Linear Models

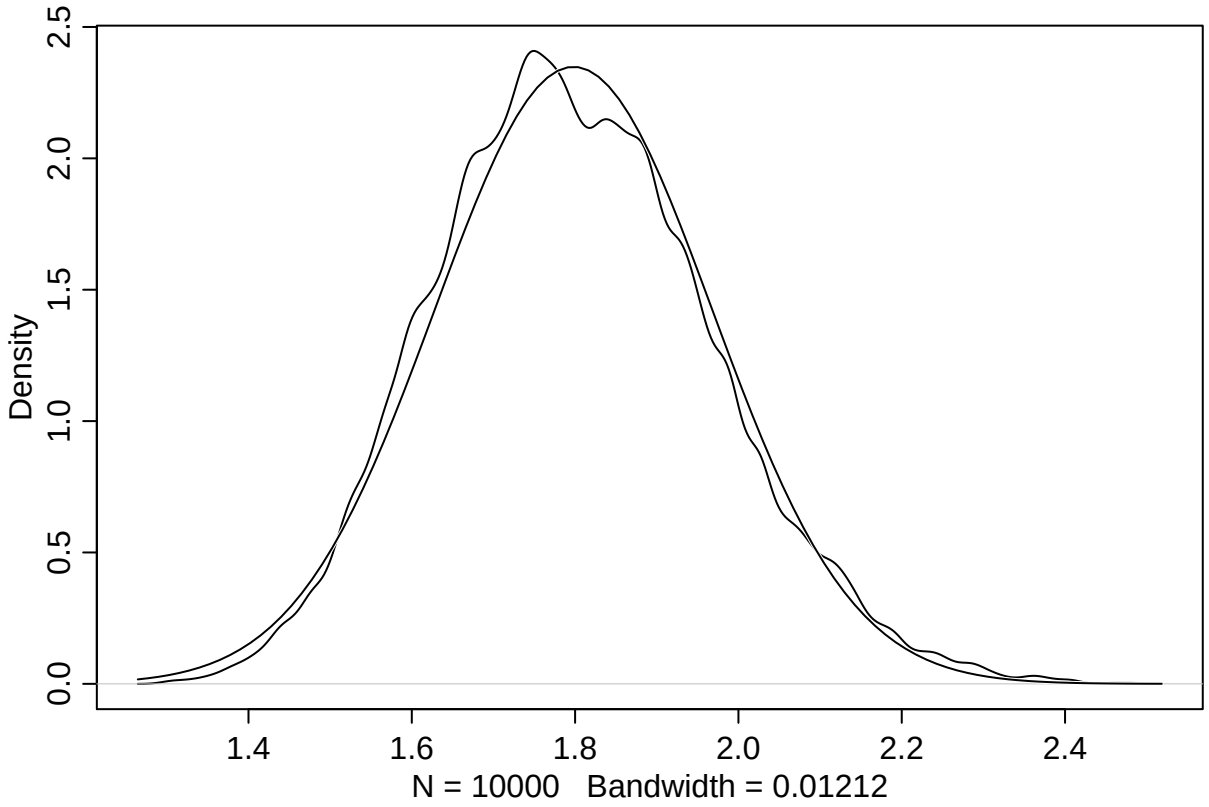
4.1.1. Normal by addition

```
# 4.1
pos <- replicate(1000, sum(runif(16, -1, 1)))
par(mfrow=c(1, 2))
dens(pos, norm.comp = T)
dens(replicate(10000, sum(runif(256, -1, 1))), norm.comp = T)
```

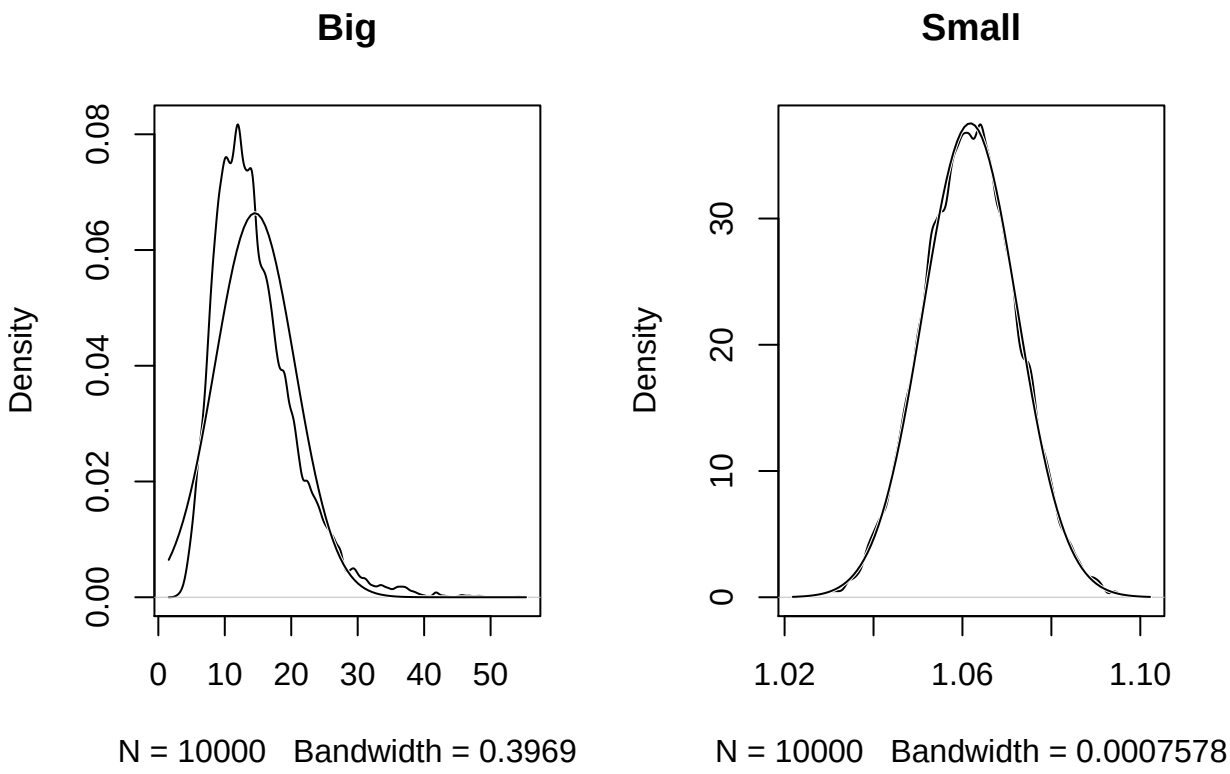


4.1.2. Normal by multiplication

```
# 4.2
dens(replicate(1e4, prod(1 + runif(12, 0, 0.1))), norm.comp = T)
```

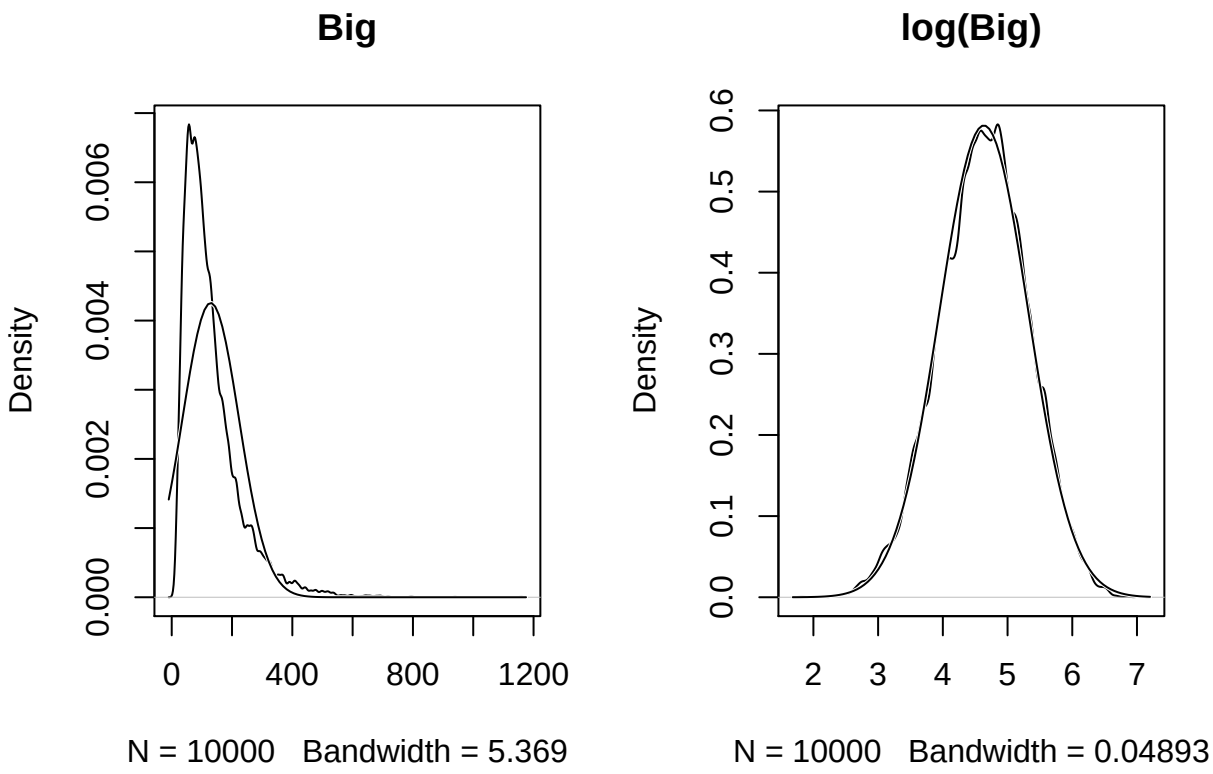



```
# 4.4
big <- replicate(1e4, prod(1 + runif(12, 0, 0.5)))
small <- replicate(1e4, prod(1 + runif(12, 0, 0.01)))
par(mfrow=c(1, 2))
dens(big, norm.comp = T, main = "Big")
dens(small, norm.comp = T, main = "Small")
```



Normal by log-multiplication

```
# 4.5
big <- replicate(1e4, prod(1 + runif(12, 0, 1)))
log_big <- log(big)
par(mfrow=c(1, 2))
dens(big, norm.comp = T, main = "Big")
dens(log_big, norm.comp = T, main = "log(Big)")
```



4.3 A Gaussian model of height

```
# 4.7
library(rethinking)
data(Howell1)
d <- Howell1
```

```
# 4.8
str(d)
```

```
## 'data.frame':    544 obs. of  4 variables:
##  $ height: num  152 140 137 157 145 ...
##  $ weight: num  47.8 36.5 31.9 53 41.3 ...
##  $ age   : num  63 63 65 41 51 35 32 27 19 54 ...
##  $ male  : int  1 0 0 1 0 1 0 1 0 1 ...
```

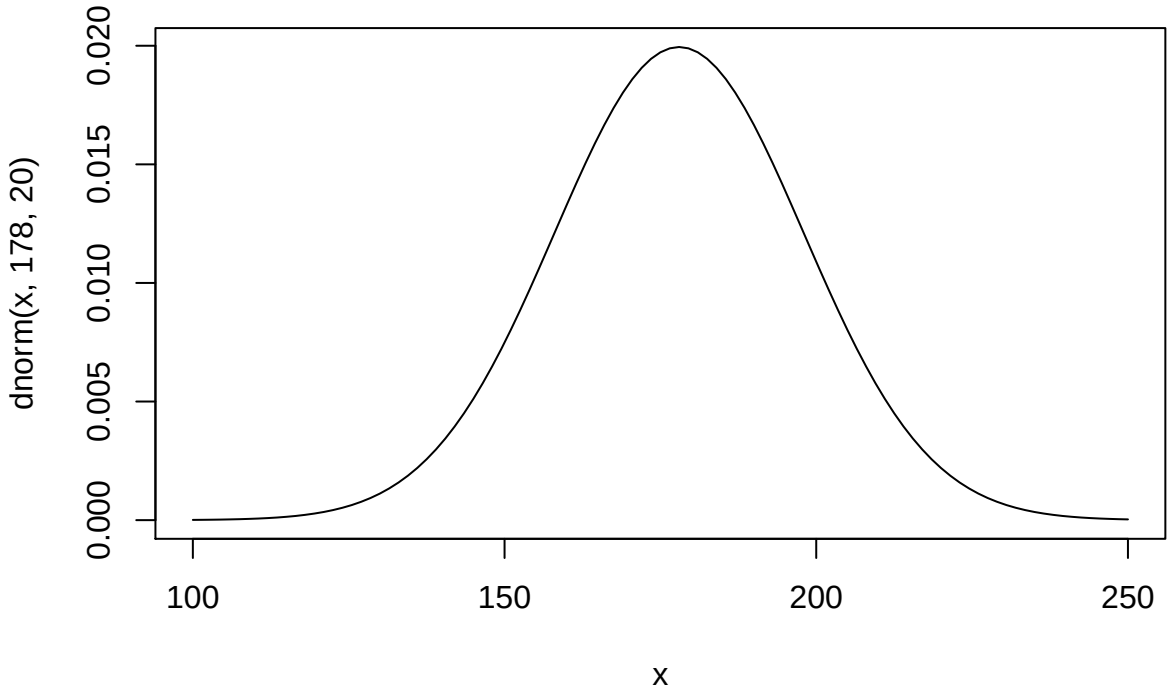
We want heights of adults only (352 rows):

```
# 4.10
d2 <- d[d$age >= 18, ]
```

4.3.2 The model

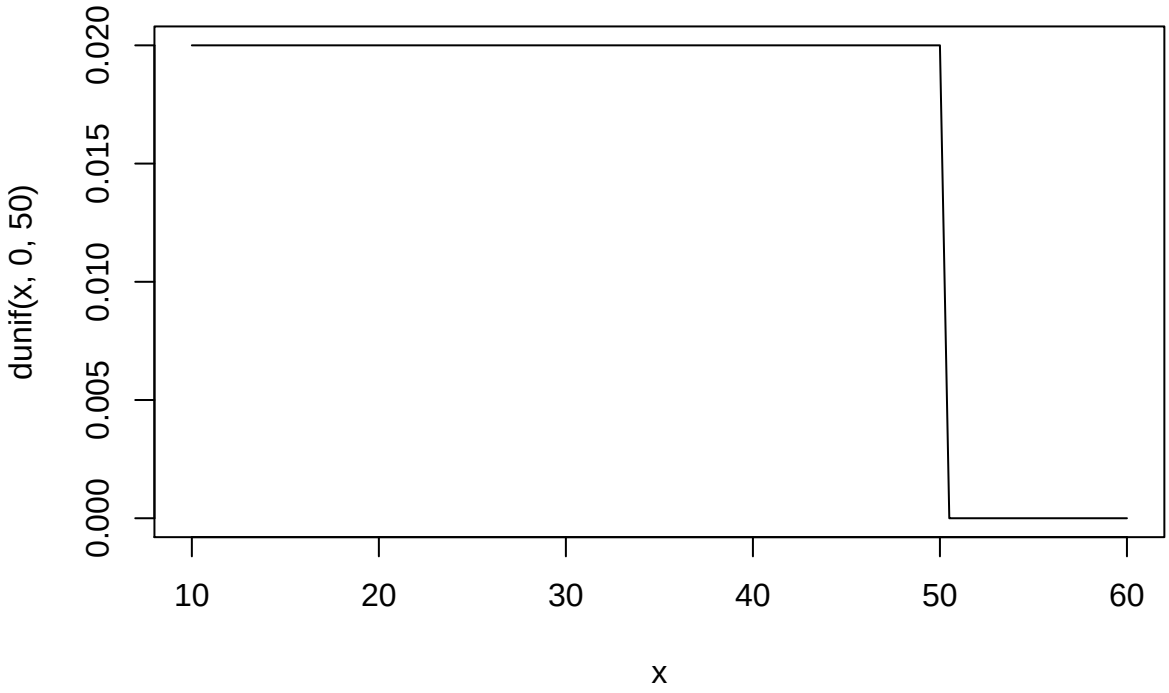
Height mean:

```r
# 4.11
curve(dnorm(x, 178, 20), from=100, to=250)
```

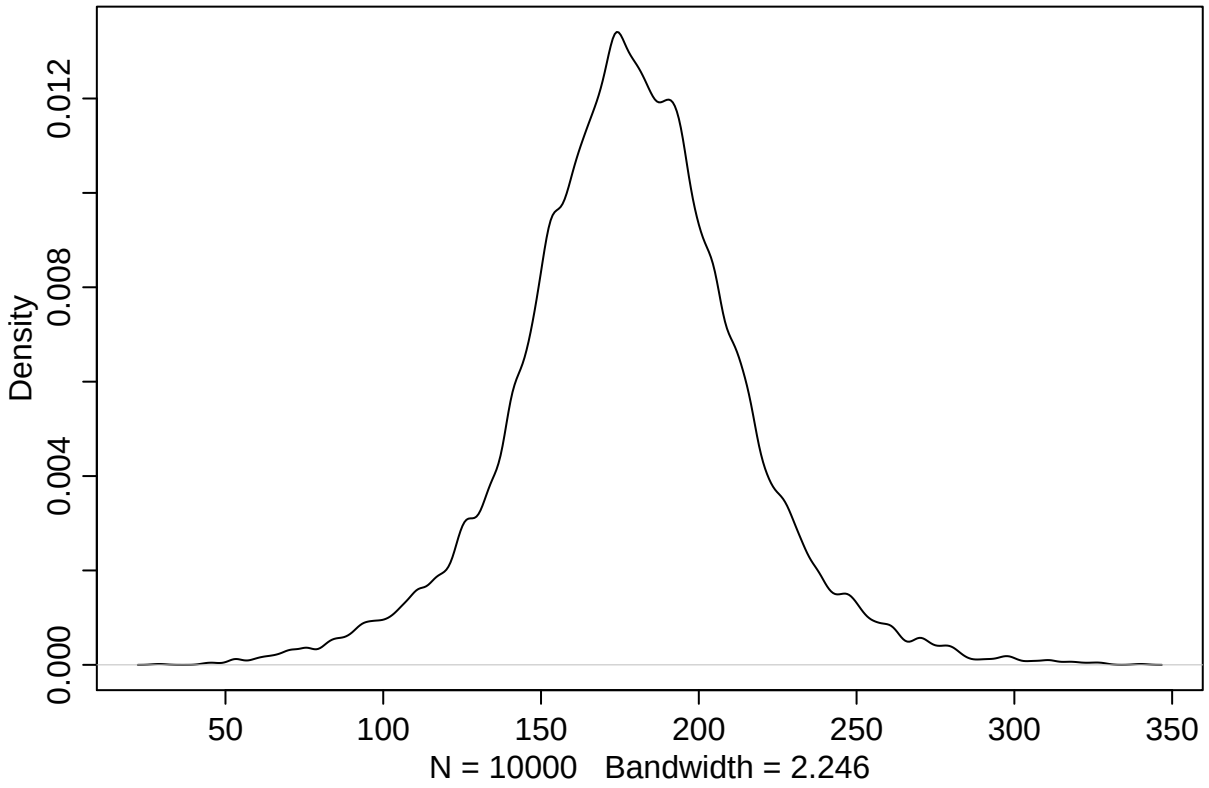


Height standard deviation:

```r
# 4.12
curve(dunif(x, 0, 50), from=10, to=60)
```




```r
# 4.13
sample_mu <- rnorm(1e4, 178, 20)
sample_sigma <- runif(1e4, 0, 50)
prior_h <- rnorm(1e4, sample_mu, sample_sigma)
dens(prior_h)
```


Density
0.000
0.004
0.008
0.012
50
100
150
200
250
300
350
N = 10000 Bandwidth = 2.246