Stat 343: Monte Carlo Integration

It can be shown that if $\mu|x_1, \ldots, x_{15} \sim \text{Normal}(45.53, 1.953^2)$ and $X|\mu \sim \text{Normal}(\mu, 8^2)$, then $X|x_1, \ldots, x_{15} \sim \text{Normal}(45.53, 1.953^2 + 8^2)$

(1) Draw a sample of size 10^6 from a normal distribution with mean 45.53 and standard deviation $\sqrt{1.953^2 + 8^2}$; save your results in a variable called x.

```
x <- rnorm(10^6, mean = 45.53, sd = sqrt(1.953^2 + 8^2))
```

(2) Use your sampled values x to estimate the expected value of $W|x_1, \ldots, x_{15}$.

```
mean(0.088 * x^3.069)
```

```
## [1] 11931.54
```

(3) Use your sampled values x to estimate the posterior probability that a newly sampled fish of this species in California will have a weight W between 25 and 30 pounds.

```
mean((0.088 * x^3.069 >= 25) & (0.088 * x^3.069 <= 30))
```

```
## [1] 1e-06
```