LATE TO CLASS AGAIN? EXERCISES

Suppose the travel times for a particular student from home to school are normally distributed with mean 20 minutes and standard deviation 4 minutes. Each day during a five-day school week she leaves home 30 minutes before class. For each of the following problems, write a short Monte Carlo simulation function to compute the probability or expectation of interest.

1) Find the expected total traveling time of the student to school for a five-day week. Find the simulation estimate and give the standard error for the simulation estimate.

```
mc.sim1 = function(){
  mu = 20; sigma = 4
  sum(rnorm(5, mu, sigma))
}

y = replicate(1000, mc.sim1())

estimate = mean(y)
se.estimate = sd(y) / sqrt(1000)
```

2) Find the probability that the student is late for at least one class in the five-day week. Find the simulation estimate of the probability and the corresponding standard error.

```
mc.sim2 = function(){
  mu = 20; sigma = 4
  times = rnorm(5, mu, sigma)
  ifelse(all(times <= 30), "on.time", "late")
}

y = replicate(1000, mc.sim2())

phat = mean(y == "late")
se.phat = sqrt(phat * (1 - phat) / 1000)}
```

3) On average, what will be the longest travel time to school during the five-day week? Again find the simulation estimate and the standard error.

```
mc.sim3 = function(){
  mu = 20; sigma = 4
  times = rnorm(5, mu, sigma)
  max(times)
}

y = replicate(1000, mc.sim3())
```

```
estimate = mean(y)
se.estimate = sd(y) / sqrt(1000)
```