

HW 1

```
library(ggplot2)
```

Task: find the area of a figure bounded by curves given by the equation:

$$y = 2|x| - \pi, x \in [-\frac{\pi}{2}, \frac{\pi}{2}]$$
$$y = |\sin(2x)|, x \in [-\frac{\pi}{2}, \frac{\pi}{2}]$$

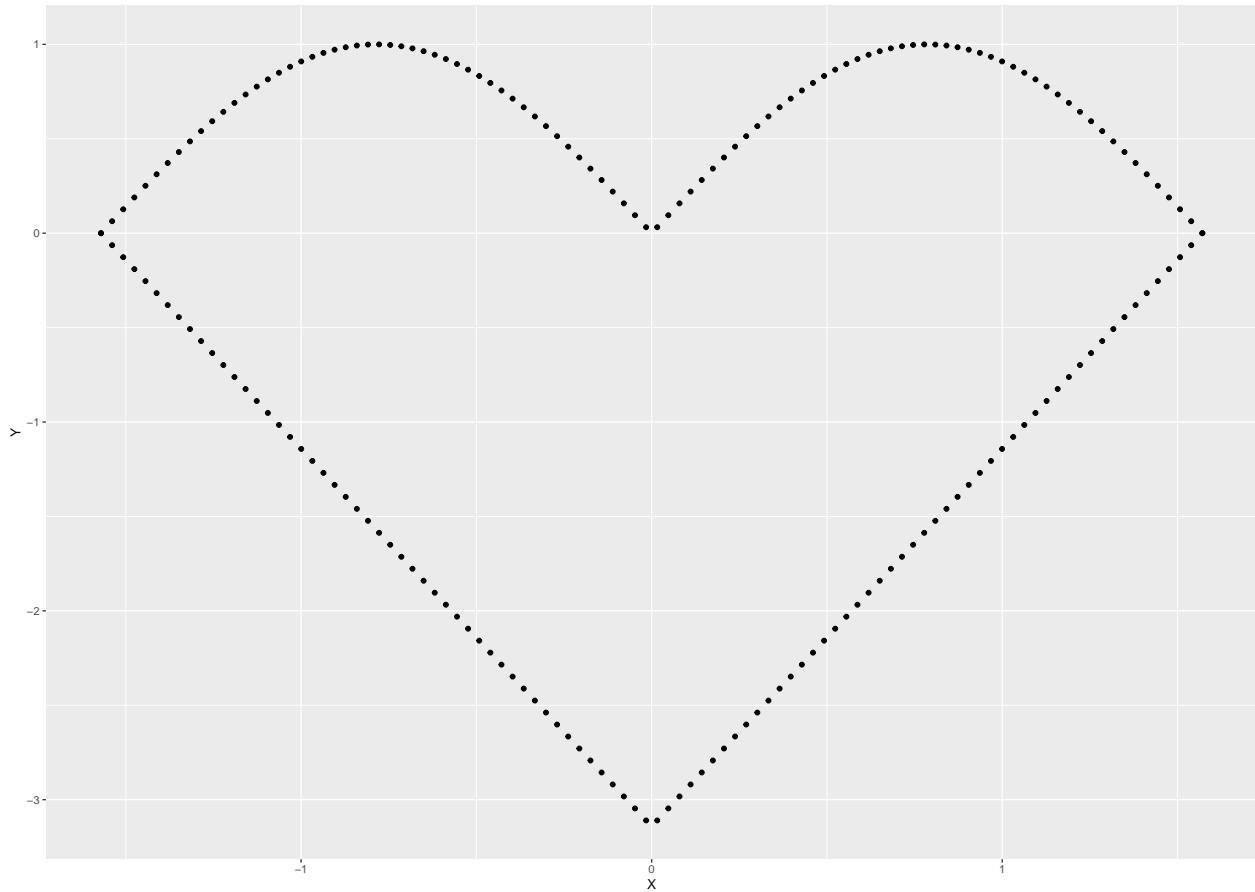
using the Monte Carlo method.

You can read about this method in any resource.

For example: www.mathonweb.com/entrain/monte/t_monte.html

This is a graphical representation of the equations:

```
x_min <- -pi/2
x_max <- pi/2
y_min <- -3.5
y_max <- 1.5
```



```

n_points <- 100000
X_mc <- runif(n_points, x_min, x_max)
Y_mc <- runif(n_points, y_min, y_max)

in_figure <- (Y_mc < abs(sin(2*X_mc))) & (Y_mc > (2*abs(X_mc) - pi))
proportion <- sum(in_figure) / n_points
area <- proportion * (x_max - x_min) * (y_max - y_min)
area

## [1] 6.944962
ggplot() + geom_point(aes(X_mc, Y_mc, colour=in_figure)) + geom_point(aes(X, Y))

```

