My first QMD File

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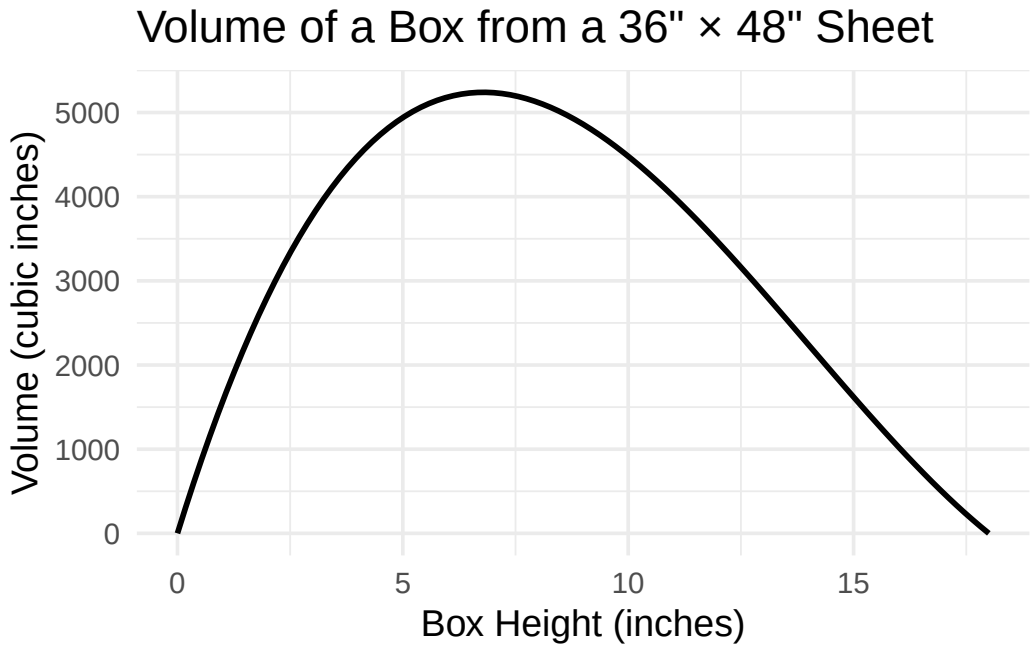
1 Plotting a Mathematical Function




```
$maximum
[1] 6.788902

$objective
[1] 5239.819
```

1.1 Based on this visualization, we can see that the max volume is about 5239 cubic inches when our side length of cut squares is about about 6.7 inches.

2 What I Feel I've Learned So Far

So far, I feel like I've gained skills for how to produce cleaner, and easy to read code. Not only that but I've gained a deeper understanding on the different kinds of visualizations and different graphs that should be used for their respective scenarios. Especially after reading the Tufte and Kosslyn readings, those readings really stuck with me when it comes to thinking about visualizations.

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3 Code Appendix

```r
boxVolume <- function(boxHeight = 1, paperLength = 48, paperWidth = 36) {
  # boxHeight: height of the box (side length of the corner cutouts)
  # paperLength: length of the sheet of paper
  # paperWidth: width of the sheet of paper

  # After removing squares of side boxHeight from each corner:
  boxWidth  <- paperWidth  - 2 * boxHeight
  boxLength <- paperLength - 2 * boxHeight

  # Volume of the resulting open-top box
  volume <- boxWidth * boxLength * boxHeight
  return(volume)
}

# Box height cannot exceed half of the smaller dimension
maxHeight <- min(36, 48) / 2   # = 18 inches

# Visualization of the Volume Function
library(ggplot2)

# Create the plot using stat_function
box_plot <- ggplot(data.frame(x = c(0, maxHeight)), aes(x = x)) +
  stat_function(fun = boxVolume, linewidth = 1) +
  labs(
    title = "Volume of a Box from a 36\" × 48\" Sheet",
    x = "Box Height (inches)",
    y = "Volume (cubic inches)"
  ) +
  theme_minimal(base_size = 14)

# Print the plot
box_plot

# Finds the boxHeight between 0 and maxHeight that maximizes volume
optimal <- optimize(
  f = boxVolume,
  interval = c(0, maxHeight),
  maximum = TRUE
)

optimal
```