Week\_02

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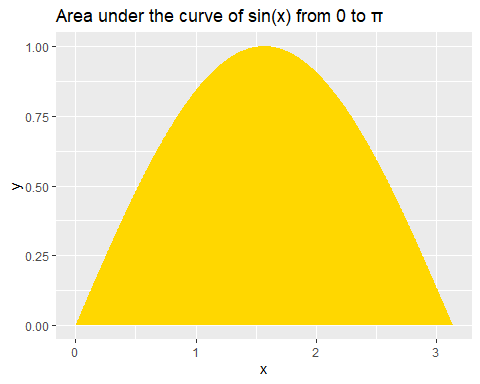
f <- function(x) { x^2 }  
result <- integrate(f, lower = 0, upper = 1)  
print(result$value)

## [1] 0.3333333

library(pracma)  
f <- function(x) { sin(x) }  
result <- integral(f, xmin = 0, xmax = pi)  
print(result)

## [1] 2

library(ggplot2)  
f <- function(x) {sin(x)}  
x\_values <- seq(0, pi, by = 0.01)  
y\_values <- f(x\_values)  
  
data <- data.frame(x = x\_values, y = y\_values)  
  
ggplot(data, aes(x = x, y = y)) +  
geom\_area(fill = "gold") +  
ggtitle("Area under the curve of sin(x) from 0 to π")



library(pracma)  
f <- function(x, y) x + y  
result <- dblquad(f, 0, 1, 0, 1)  
print(result)

## [1] 1

f <- function(x, y) { x \* y }  
double\_integral <- function(x) {  
sapply(x, function(x) integrate(f, lower = 0, upper = 1, y = x)$value)}  
result <- integrate(double\_integral, lower = 0, upper = 1)  
print(result$value)

## [1] 0.25

# Example dataset  
time <- seq(0, 10, by = 0.1)  
velocity <- 3 \* time^2 - 2 \* time + 1   
data <- data.frame(time = time, velocity = velocity)  
distance\_function <- function(t) { 3 \* t^2 - 2 \* t + 1 }  
result <- integrate(distance\_function, lower = 0, upper = 10)  
print(result$value)

## [1] 910

# Cumulative distance  
cumulative\_distance <- cumsum(velocity) \* 0.1  
# Visualization  
data$cumulative\_distance <- cumulative\_distance  
ggplot(data, aes(x = time)) +  
geom\_line(aes(y = velocity), color = "blue") +  
geom\_line(aes(y = cumulative\_distance), color = "red") +  
ggtitle("Velocity (blue) and Cumulative Distance (red) over Time")

