

DaigleInClassLabWk14D1.R

2011home

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# Chris Daigle
# Week 14 D1 In Class Lab

# 1. Take a derivative of the cdf of N(2, 2^2) at x = 0
# pnorm(x, mean, sd, ...) is the cdf of normal
f <- function(x) {
  f <- pnorm(x, mean = 2, sd = 4)
  return(f)
}

f_dev <- function(x, f) {
  h <- 1e-8
  f_dev <- (f(x + h) - f(x)) / h
  return(f_dev)
}

f_dev(x = 0, f = f)

## [1] 0.08801633

# 2. Calculate the volume of half sphere with a radius of 1.
# General form:  $\int_a^b \pi \sqrt{r^2 - x^2} dx = 4\pi(r^3)/3$ 

x <- c(0,1) # for half and not the whole, if whole, c(-1,1)
h <- 0.0000001
r <- 1

s <- function(r,x) {
  return(pi*((r ^ 2) - (x ^ 2)))
}

sphere <- function(x, s, h) {
  volume <- 0
  for (i in seq(from = x[1], to = x[2] - h, by = h)) {
    volume <- volume + h*s(r,i)
  }
  return(volume)
}

sphere(x, s, h)

## [1] 2.094395
```

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# Check
(1/2)*(4*pi*((r^2)/3))

## [1] 2.094395

# 3. Find maximizer of the following
# Suppose that we allocate our budget between online and TV advertisements to
# maximize revenue
# (1) The effects on revenue for each advertisement is $200 and $600
# (2) The cost 1 for each advertisement is $150 and $100 and total expense
# for this cannot be more than $10000.
# (3) The cost 2 for each advertisement is $50 and $300 and total expense for
# this cannot be more than $10000.
# (4) At Least we should have 95 advertisements in total.

# I interpret this as two scenarios: cost 1 and cost 2 scenario

library('lpSolve')
#Scenario 1:
#  $\max \pi = 200X + 600Y - 150X - 100Y = 50X + 500Y$ 
# s.t.
#  $150X + 100Y \leq 10,000$ 
#  $X + Y \geq 95$ 

obj.fun <- c(50, 500)
const <- matrix(c(150, 100, 1, 1), ncol = 2, byrow = TRUE)
const.dir <- c('<=', '>=')
rhs <- c(10000, 95)

Scenario1 <- lp('max', obj.fun, const, const.dir, rhs)
Scenario1$solution

## [1] 0 100

#
# Scenario 2:
#  $\max \pi = 200X + 600Y - 50X - 300Y = 150X + 300Y$ 
# s.t.
#  $50X + 300Y \leq 10,000$ 
#  $X + Y \geq 95$ 
obj.fun <- c(150, 300)
const <- matrix(c(50, 300, 1, 1), ncol = 2, byrow = TRUE)
const.dir <- c('<=', '>=')
rhs <- c(10000, 95)

Scenario2 <- lp('max', obj.fun, const, const.dir, rhs)
Scenario2$solution

## [1] 200 0

```