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

# 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:  
# maxπ = 200X+600Y - 150X - 100Y = 50X+500Y  
# s.t.  
# 150X + 100Y <= 10,000  
# X + Y >= 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:  
# maxπ = 200X+600Y - 50X - 300Y = 150X+300Y  
# s.t.  
# 50X + 300Y <= 10,000  
# X + Y >= 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