> # Exercise

> # 1. Take a derivative of the cdf of N(2, 2^2) at x=0.

>

> x <- 0

> cdf <- function(x) {

+ cdf <- pnorm(x, 2, 2^2)

+ return(cdf)

+ }

>

> cdf\_der <- function(x, cdf) {

+ h <- 1e-8

+ cdf\_der <- cdf(x+h)-cdf(x)

+ return(cdf\_der)

+ }

>

> cdf\_der(x=x, cdf=cdf)

[1] 8.801633e-10

>

> pnorm(1e-8, 2, 2^2)-pnorm(0, 2, 2^2)

[1] 8.801633e-10

>

>

>

>

>

> # 2. Calculate the volume of a half sphere with a radius of 1.

>

> x <- c(0,1)

> r <- 1

>

> s <- function(r, x) {

+ s <- (pi \* (r^2 - x^2))

+ return(s)

+ }

>

> sphere\_int <- function(x, s) {

+ h <- 0.00001

+ area <- 0

+ for(i in seq(from=x[1], to=x[2]-h, by=h)) {

+ area <- area + h\*s(r, i)

+ }

+ return(area)

+ }

>

> sphere\_int(x, s)

[1] 2.094411

>

>

>

>

>

> # 3. Find maximizer of the following

> # (1) The effects on revenue for each advertisement is $2000 and $6000

> # Objective: f(x,y) = 2000x + 6000y

> # (2) The price for each advertisement is $30 and $20 and total expense

> # for this cannot be more than $5000

> # S.t. 30x + 20y <= 5000

> # (3) The price for models for each advertisement is $5 and $10 and total

> # expense for this cannot be more than $3000

> # S.t. 5x + 10y <= 3000

> # (4) At least we should have 95 advertisements in total

> # x >= 0, y >= 0, x + y >= 95

>

> ##install.packages("lpSolve")

>

> library(lpSolve)

>

> obj.fun <- c(1,1)

> const <- matrix(c(30,20,5,10,1,0,0,1,1,1), ncol=2, byrow=TRUE)

> const.dir <- c("<=", "<=", ">=", ">=", ">=")

> rhs <- c(5000, 3000, 0, 0, 95)

>

> prod.sol <- lp("max", obj.fun, const, const.dir, rhs)

> prod.sol$solution

[1] 0 250