Homework 1 Part 1

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```
library(rgl)
```

Problem 1: Graphing a bivariate function and its second order approximation

i) Write an R function that computes the function f for any input x_1 and x_2

```
f <- function(x1,x2) {cos(x1*x2)}
```

ii) Write an R function that computes the function h for any input x_1, and x_2

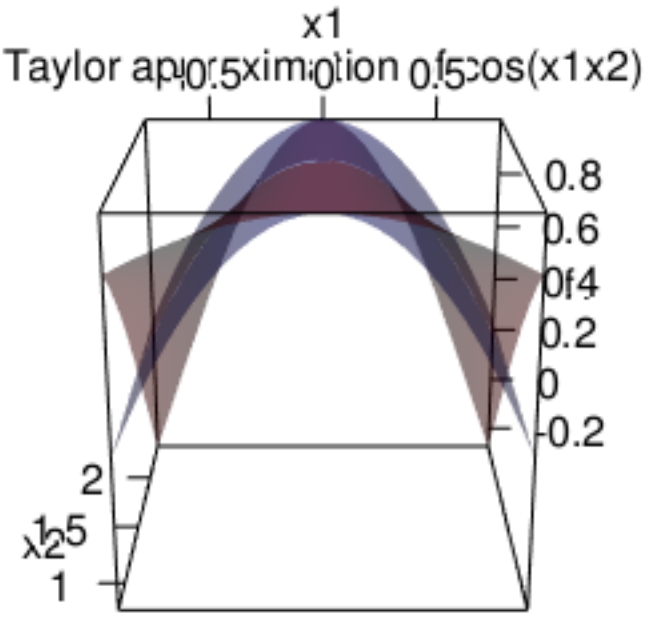
```
h <- function(x1,x2) {1 - ((pi^2/8)*(x1)^2)}
```

iii) and iv)

```
x1 <- seq(from = -pi/4, to = pi/4, length = 30)
x2 <- seq(from = pi/4, to = 3*pi/4, length = 30)
f1 <- outer(x1, x2, FUN = f)
persp3d(x1, x2, f1, col = "red", shade = 0.1 ,alpha = 0.5, xlab = "x1", ylab = "x2", main = "Taylor appr
h1 <- outer(x1, x2, FUN = h)
persp3d(x1,x2, h1, col = "blue", shade = 0.1, alpha = 0.5, add = TRUE)
rglwidget(controllers = )
```

```
## Warning in snapshot3d(scene = x, width = width, height = height): webshot =
## TRUE requires the webshot2 package; using rgl.snapshot() instead
```

```
## cleared error 1285
```



v and vi

```
errorf <- abs(f1 - h1)
persp3d(x1, x2, errorf, col = "red", alpha = 0.5, xlab = "x1", ylab = "x2", main = "The error in second
rglwidget(controllers = )
```

```
## Warning in snapshot3d(scene = x, width = width, height = height): webshot =
## TRUE requires the webshot2 package; using rgl.snapshot() instead
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```
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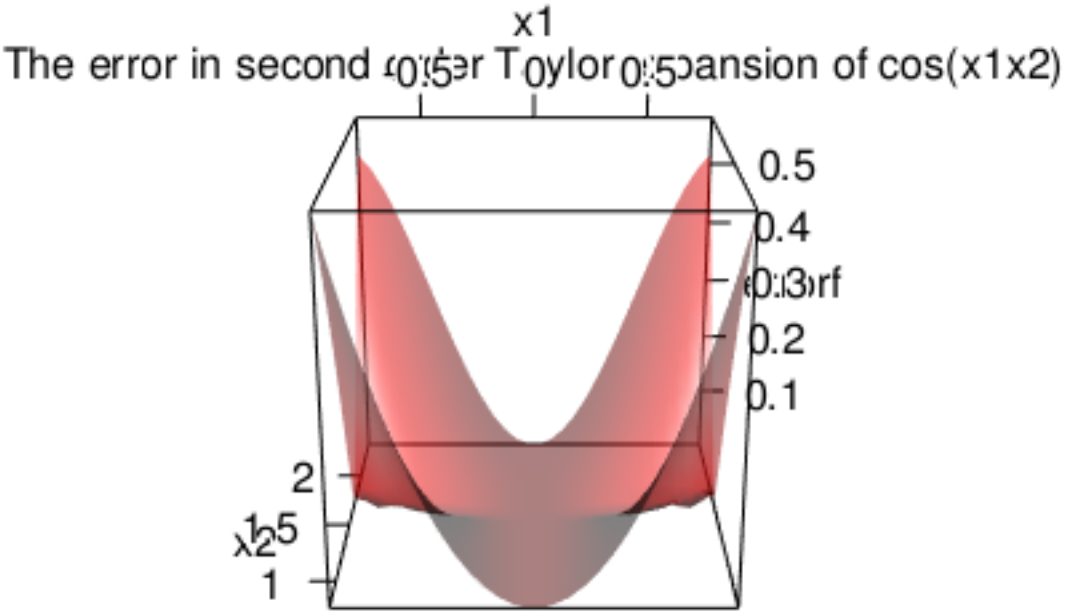

vii

```
filled.contour(x1, x2, errorf)
grid(nx = 20, ny = 20)
```