Assignment 6

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```
library(pracma)
###Question 1
#(i)
f <- function(x,y){
  2*(2*x+3*y)/5
}

g <- function(y){
  2*(2+3*y)/5
}

h <- function(x){
  2*(2*x)/5
}

e <- function(x,y){
  2*x*y*(2*x+3*y)/5
}

val <- integral2(f,0,1,0,1)$Q;

if(val == '1'){
  sprintf('Yes it is a joint pdf');
}else{
  sprintf('No, it is not a joint pdf');
}
```

```
## [1] "Yes it is a joint pdf"
```

```
#(ii)
g_x <- integral(g,0,1);
print(g_x)
```

```
## [1] 1.4
```

```
#(iii)
h_y <- integral(h,0,1);
print(h_y)
```

```
## [1] 0.4
```

```r
#(iv)
E_xy <- integral2(e,0,1,0,1)$Q;
print(E_xy)
```

```
## [1] 0.3333333
```

```r
###Question 2
#(i)
f <- function(x,y){
  (x + y)/30;
}

p <- function (x,y){
  x*y*(x+y)/30
}

m <- matrix(c(f(0,0:2),f(1,0:2),f(2,0:2),f(3,0:2)),nrow=4,ncol=3,byrow = TRUE);
m;
```

```
##            [,1]       [,2]       [,3]
## [1,] 0.00000000 0.03333333 0.06666667
## [2,] 0.03333333 0.06666667 0.10000000
## [3,] 0.06666667 0.10000000 0.13333333
## [4,] 0.10000000 0.13333333 0.16666667
```

```r
#(ii)
if(sum(m)==1){
  sprintf('It is a joint mass function\n');
}else{
  sprintf('It is not a joint mass function');
}
```

```
## [1] "It is not a joint mass function"
```

```r
#(iii)
g_x <- apply(m,1,sum)
g_x
```

```
## [1] 0.1 0.2 0.3 0.4
```

```r
#(iv)
h_y <- apply(m,2,sum)
h_y
```

```
## [1] 0.2000000 0.3333333 0.4666667
```

```r
#(v)
cond_prob = m[1,2]/h_y[2]
cond_prob
```

```
## [1] 0.1
```

```
#(vi)
x <- c(0:3)
E_x <- sum(x*g_x)
E_x
```

```
## [1] 2
```

```
E_x_2 <- sum(x*x*g_x)
var_x <- E_x_2 - E_x^2
var_x
```

```
## [1] 1
```

```
y <- c(0:2)
E_y <- sum(y*h_y)
E_y
```

```
## [1] 1.266667
```

```
E_y_2 <- sum(y*y*h_y)
var_y <- E_y_2 - E_y^2
var_y
```

```
## [1] 0.5955556
```

```
E_xy <- sum(matrix(c(p(0,0:2),p(1,0:2),p(2,0:2),p(3,0:2)),nrow=4,ncol=3,byrow = TRUE))
E_xy
```

```
## [1] 2.4
```

```
cov_xy = E_xy - E_x*E_y
cov_xy
```

```
## [1] -0.1333333
```

```
correlation_coeff = cov_xy/(sqrt(var_x*var_y))
correlation_coeff
```

```
## [1] -0.1727737
```