21BDS0340

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Probability and Statistics Lab

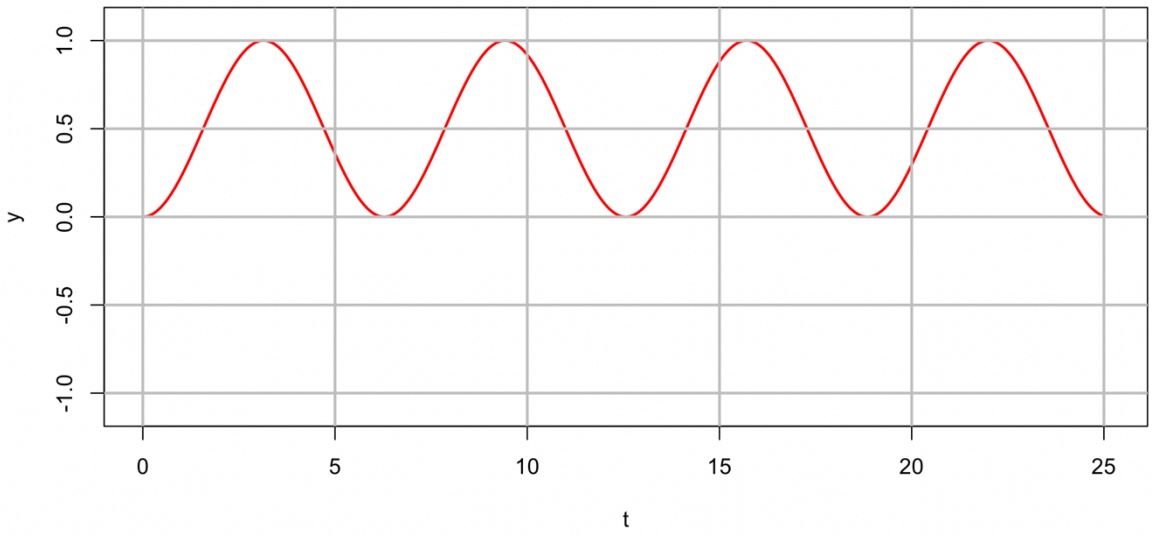
Lab Assessment – I

Question 1

Code: Graph 1

```
t = seq(0, 8*pi, 0.01)
y = (1 - cos(t)) / 2
plot(t, y, type="l", col="red", ylim=c(-1.1, 1.1), lwd=2)
grid(nx=NULL, ny= NULL, lty=1, col="gray", lwd=2)
```

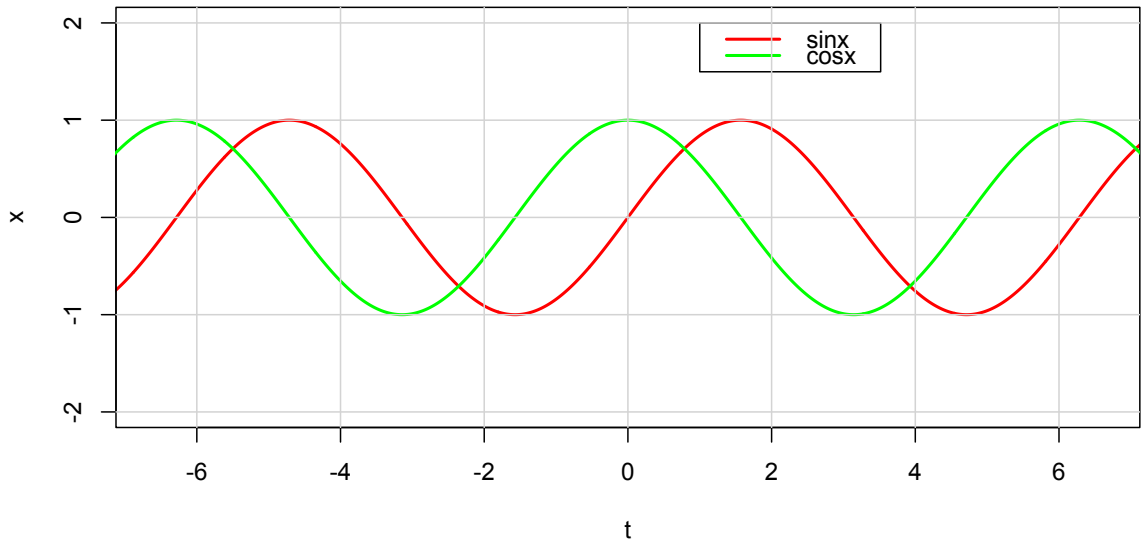
Output: Graph 1



Code: Graph 2

```
t = seq(-3*pi, 3*pi, 0.01)
y = cos(t)
x = sin(t)
plot(t, x, type="l", col="red", lwd=2, ylim=c(-2, 2), xlim=c(-
 2.1*pi, 2.1*pi))
lines(t, y, type="l", col="green", lwd=2)
legend(2, legend=c("sinx", "cosx"), lty=1, lwd=2, col=c("red",
 "green"))
grid(nx=NULL, ny=NULL, lty=1, lwd=1)
```

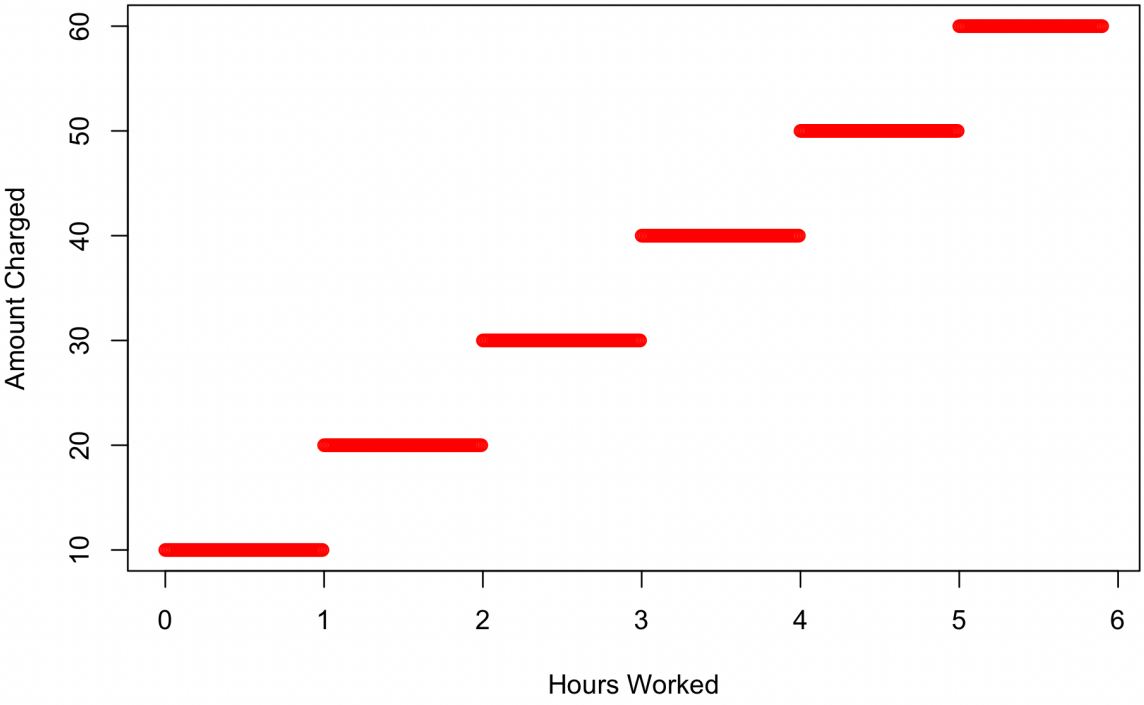
Output: Graph 2



Code: Graph 3

```
x = seq(0, 5.9, 0.01)
y = 10 + 10 * floor(x)
plot(x, y, lty=1, lwd=1, col="red", xlab="Hours Worked",
ylab="Amount Charged")
```

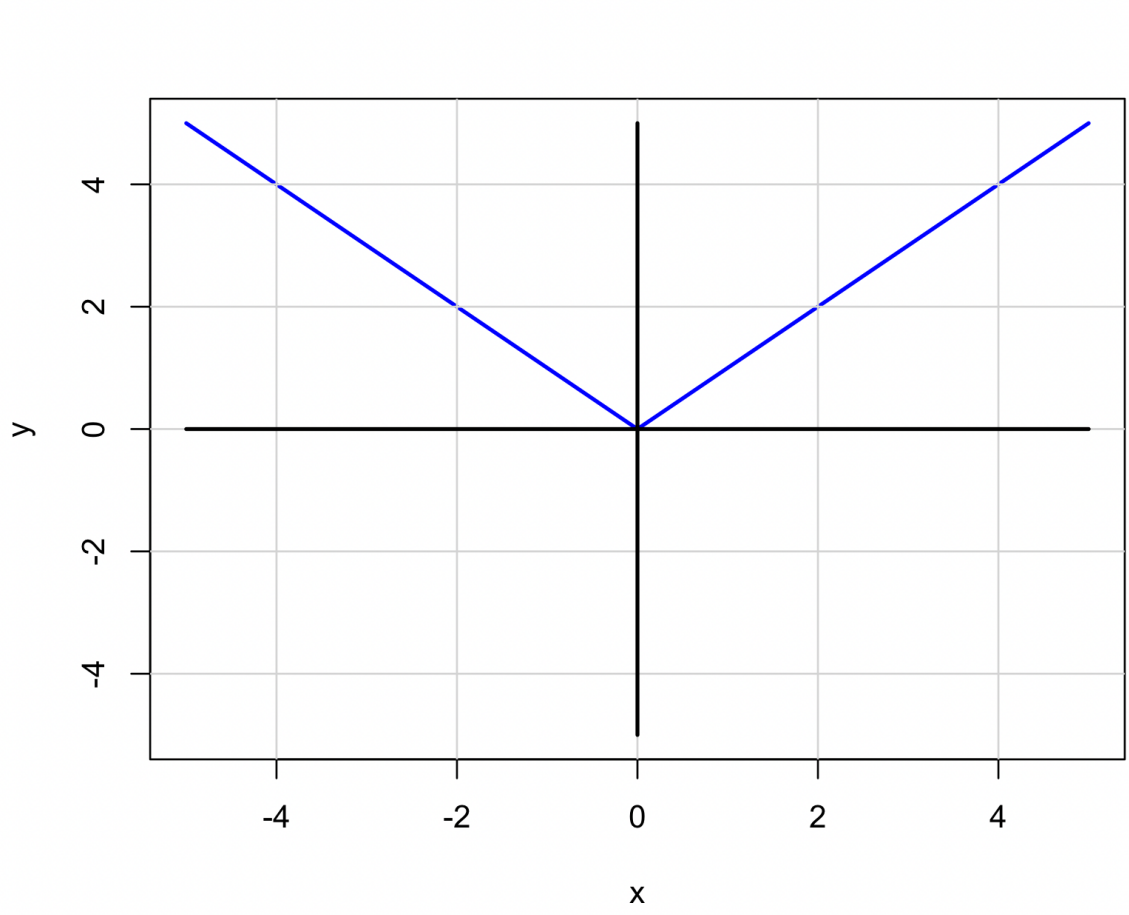
Output: Graph 3



Code: Graph 4

```
x = seq(-5, 5, 0.1)
y = abs(x)
plot(x, y, type="l", lwd=2, col="blue", ylim=c(-5, 5))
grid(nx=NULL, ny=NULL, lty=1)
lines(x, rep(0, length(x)), lwd=2, col="black")
lines(rep(0, length(x)), x, lwd=2, col="black")
```

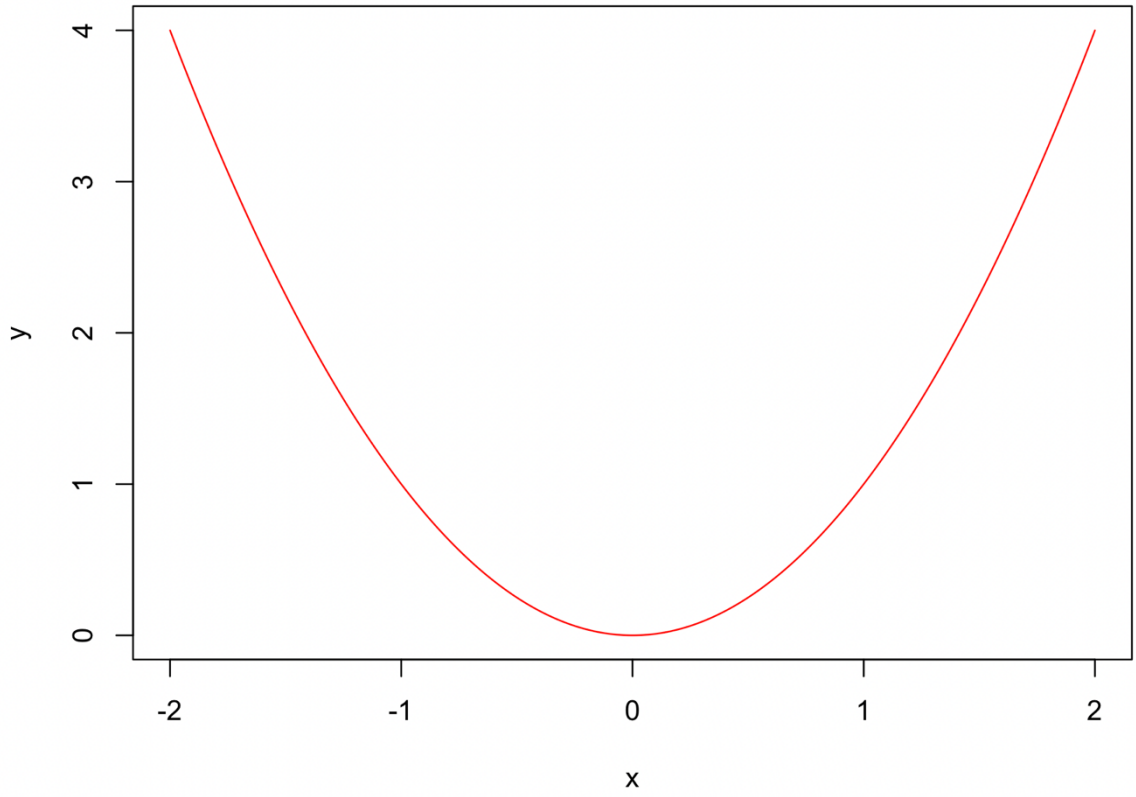
Output: Graph 4



Code: Graph 5

```
x = seq(-2, 2, 0.01)
y = x * x
plot(x, y, type="l", col="red")
```

Output: Graph 5



Question 2

Code:

```
n = readline()
n = as.integer(n)
x = 0
a = 0
b = 1
while(x < n){
 print(a)
 b = a + b
 a = b - a
 x = x + 1
}
```

Output:

```
[1] 0
[1] 1
[1] 1
[1] 2
[1] 3
[1] 5
[1] 8
[1] 13
[1] 21
[1] 34
```

Question 3

Code:

```
A = matrix(c(1, 2, -8, 14, 7, 13, 24, 17, 5, 9, 7, 32, 10, 14, 5, 3,
 4, 53, 34, 43, 9, 11, 14, -10, 4), 5, 5)
B = matrix(c(-10, 12, 11, 4, 2, 9, 21, 7, 13, 8, 17, 2, 1, 17, -19,
 2, 7, 5, 3, 4, 15, 1, 4, -31, 14), 5, 5)
print("A: ")
print(eigen(A))
print("B: ")
print(eigen(B))
if(all.equal(solve(A %*% B), solve(B) %*% solve(A))){
 print("Inverse of AB is equal to inverse of B * inverse of A")
}
print("The dimension of 4*A^5 - 5*A^3 + A^2 is 5 x 5")
A[4, ] = c(5, -4, 6, 3, 2)
print(A)
B[, 5] = c(14, 9, 43, 4, 26)
print(B)
```

Output:

```
[1] "A: "
eigen() decomposition
$values
[1] 65.237708+ 0.00000i  4.280246+13.39402i  4.280246-13.39402i -9.199137+ 0.00000i  8.400937+ 0.00000i

$vectors
             [,1]                  [,2]                  [,3]          [,4]           [,5]
[1,] -0.2520913+0i  0.1843370-0.1894396i  0.1843370+0.1894396i  0.1569503+0i  0.74662508+0i
[2,] -0.5894957+0i  0.7210633+0.0000000i  0.7210633+0.0000000i -0.6918215+0i  0.31480324+0i
[3,] -0.5659313+0i -0.2952665+0.3337371i -0.2952665-0.3337371i  0.5818467+0i -0.34645259+0i
[4,] -0.3341177+0i -0.1466034-0.1369498i -0.1466034+0.1369498i -0.0686653+0i -0.09986256+0i
[5,] -0.3962725+0i -0.4139022-0.0086341i -0.4139022+0.0086341i  0.3917768+0i  0.46200431+0i

[1] "B: "
eigen() decomposition
$values
[1]  32.70316+ 0.00000i -21.55109+ 0.00000i   6.55190+10.80064i   6.55190-10.80064i   4.74412+ 0.00000i

$vectors
               [,1]           [,2]                   [,3]                   [,4]           [,5]
[1,] -0.34436533+0i -0.89762345+0i -0.34269723-0.02492796i -0.34269723+0.02492796i  0.21479221+0i
[2,] -0.71239171+0i  0.23111639+0i -0.07119562-0.01549784i -0.07119562+0.01549784i  0.22966375+0i
[3,] -0.36309551+0i  0.33204798+0i -0.15409365+0.02198836i -0.15409365-0.02198836i  0.01253631+0i
[4,] -0.48600546+0i  0.01410987+0i  0.83875175+0.00000000i  0.83875175+0.00000000i -0.93132345+0i
[5,] -0.07662189+0i  0.17436283+0i -0.25468027-0.28988503i -0.25468027+0.28988503i  0.18329853+0i

[1] "Inverse of AB is equal to inverse of B * inverse of A"
[1] "The dimension of 4*A^5 - 5*A^3 + A^2 is 5 x 5"
     [,1] [,2] [,3] [,4] [,5]
[1,]    1   13    7    3    9
[2,]    2   24   32    4   11
[3,]   -8   17   10   53   14
[4,]    5   -4    6    3    2
[5,]    7    9    5   43    4
     [,1] [,2] [,3] [,4] [,5]
[1,]  -10    9   17    2   14
[2,]   12   21    2    7    9
[3,]   11    7    1    5   43
[4,]    4   13   17    3    4
[5,]    2    8  -19    4   26
```