

Linear Programming Problem (LPP)

Linear Programming Problem using R

Problem Statement

Graph each of the following constraint equations in R. You do not need to shade feasible regions. A. $x + y \geq 4$, $x + y \leq 2$ B. $x + y \leq 2$, $x - y \leq 1$

Load Package

```
if(!require("ggplot2")){install.packages("ggplot2")}
```

```
## Loading required package: ggplot2
```

Problem A

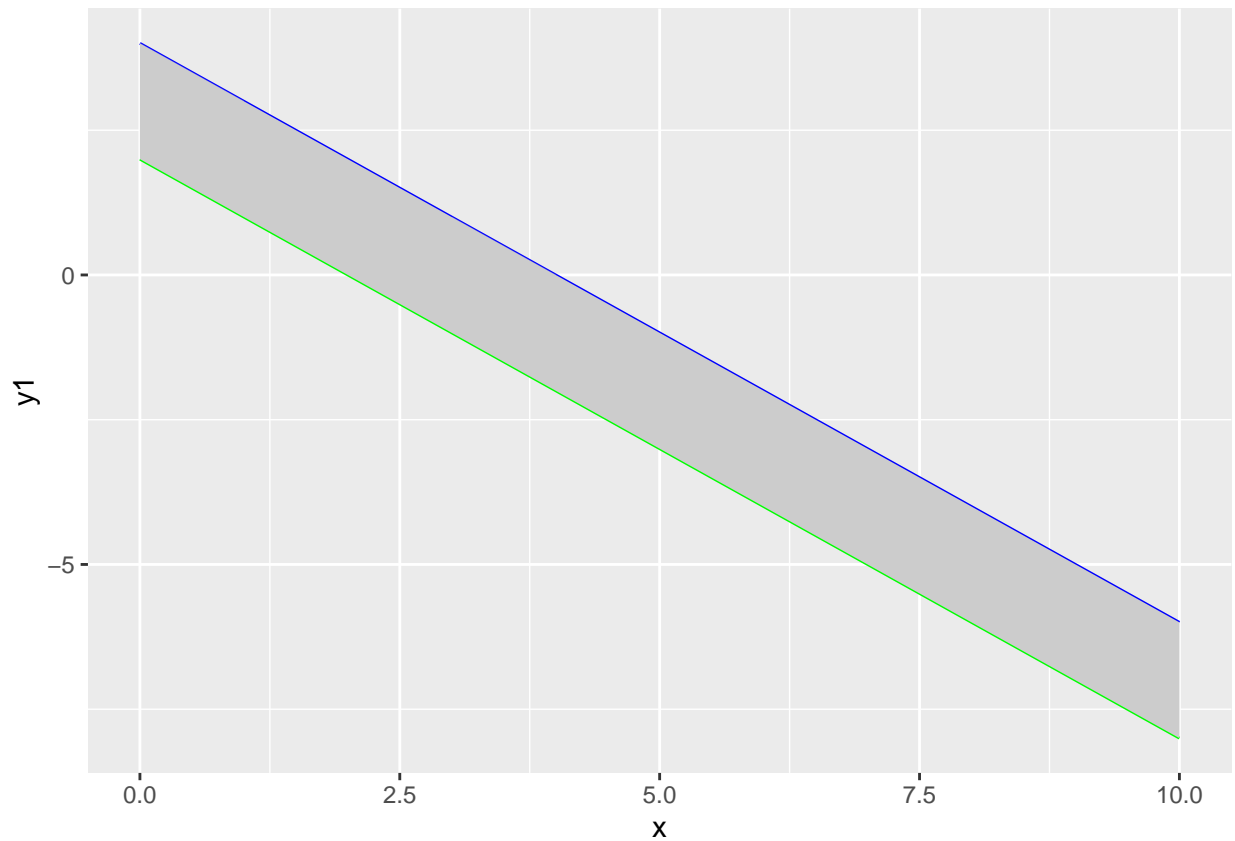
```
### Solving A,  $x + y \geq 4$ ,  $x + y \leq 2$ 
###            $y \geq -x + 4$ ,  $y \leq -x + 2$ 

fun1 = function(x) -1*x + 4      ## y1
fun2 = function(x) -1*x + 2      ## y2

#Create range of x values
x=seq(0,10)

#Plug x values into constraint functions
mydf = data.frame(x, y1=fun1(x), y2=fun2(x))

#Plot functions
g = ggplot(mydf, aes(x = x)) +
  geom_line(aes(y = y1), colour = 'blue') +
  geom_line(aes(y = y2), colour = 'green')+
  geom_ribbon(aes(ymin=y1, ymax=y2),fill='gray80')
g
```



Solution of A is feasible but unbounded

Problem B

```
### Solving B,  $x + y \leq 2$  ,  $x - y \leq 1$ 
###            $y \leq -x + 2$ ,  $y \geq x - 1$ 

fun1 = function(x) -1*x + 2      ## y1
fun2 = function(x) x - 1        ## y2

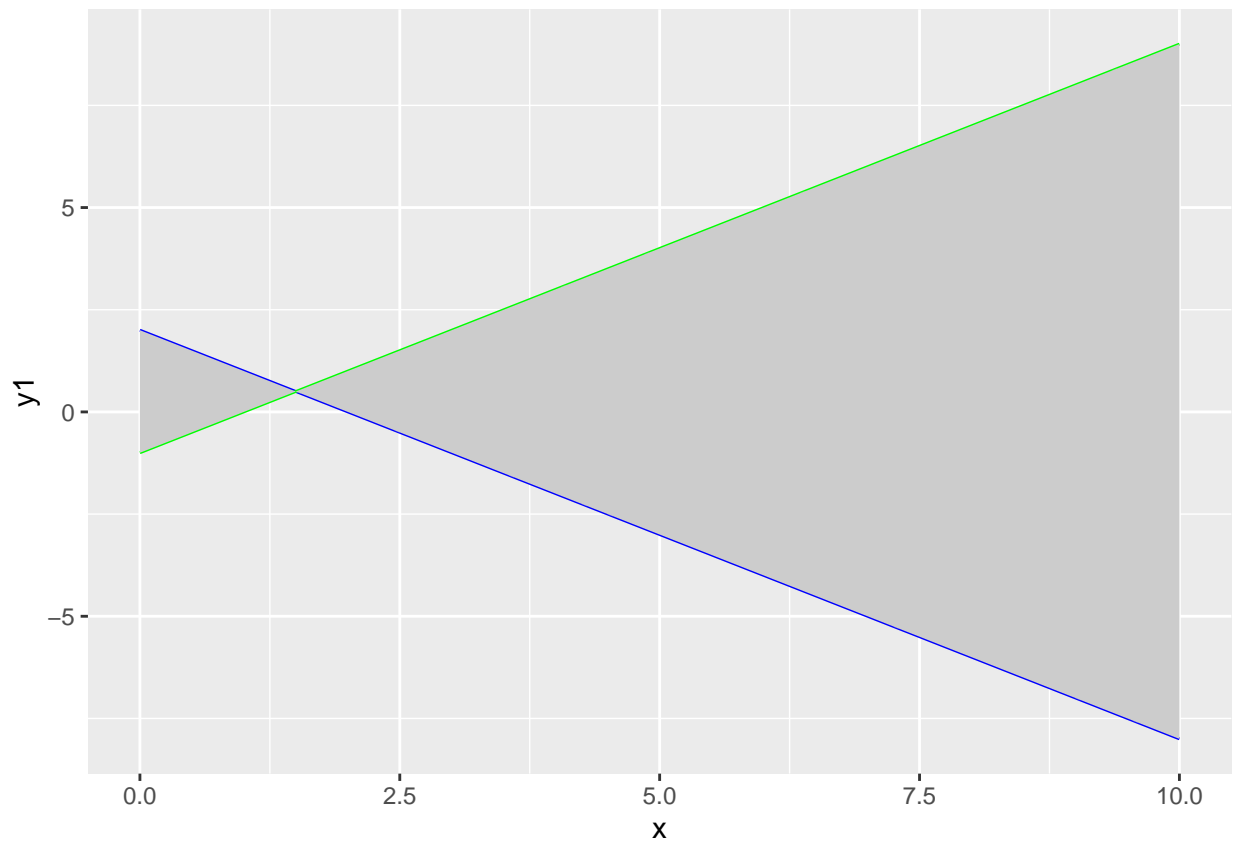
#Create range of x values
x=seq(0,10, by = 0.05)  # x=seq(0,10) will not give correct region as pmin(y1, y2) values will be disc

#Plug x values into constraint functions
mydf = data.frame(x, y1=fun1(x), y2=fun2(x))
head(mydf)

##      x  y1  y2
## 1 0.00 2.00 -1.00
## 2 0.05 1.95 -0.95
```

```
## 3 0.10 1.90 -0.90
## 4 0.15 1.85 -0.85
## 5 0.20 1.80 -0.80
## 6 0.25 1.75 -0.75
```

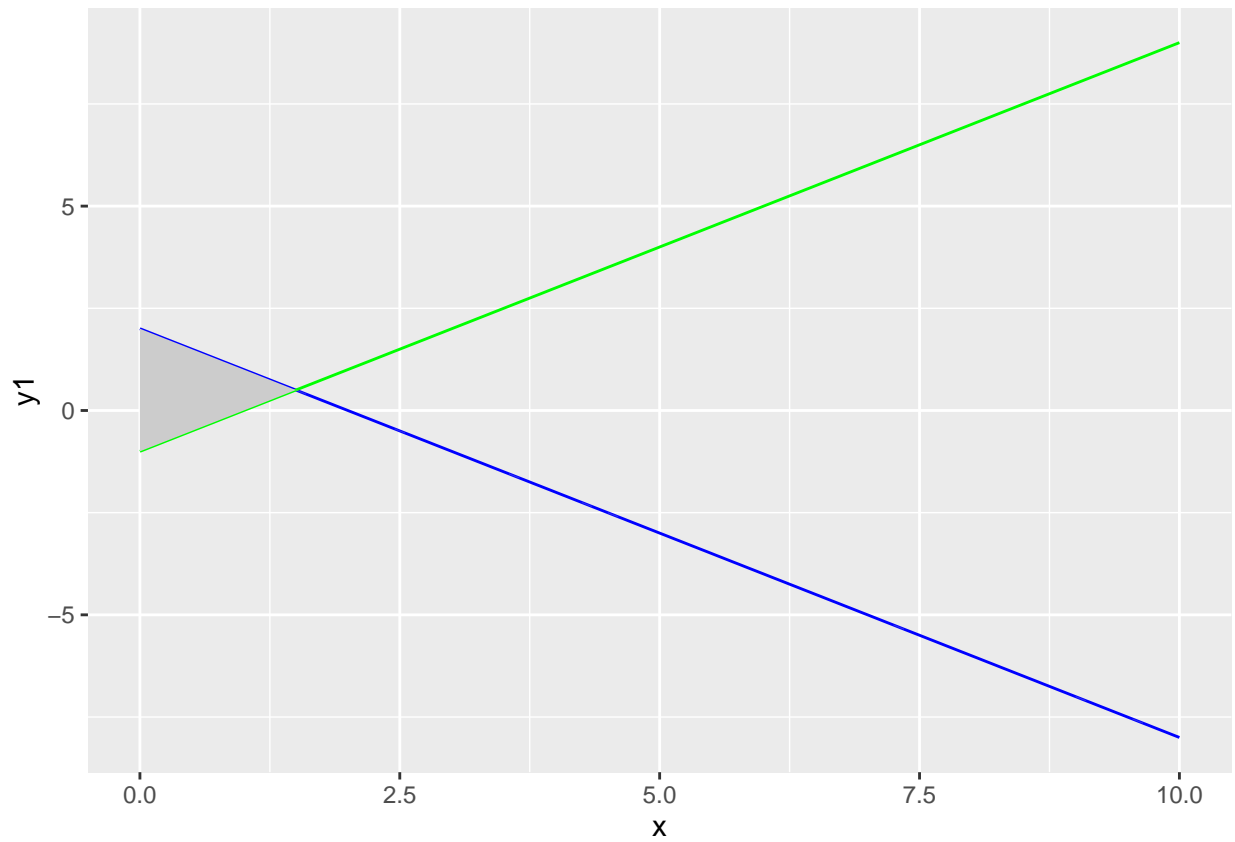
```
#Plot functions
g = ggplot(mydf, aes(x = x)) +
  geom_line(aes(y = y1), colour = 'blue') +
  geom_line(aes(y = y2), colour = 'green')+
  geom_ribbon(aes(ymin=y1, ymax=y2),fill='gray80')
g
```



```
# Correcting the area shaded
mydf1 = transform(mydf, z = pmin(y1,y2))
head(mydf1)
```

```
##      x  y1  y2  z
## 1 0.00 2.00 -1.00 -1.00
## 2 0.05 1.95 -0.95 -0.95
## 3 0.10 1.90 -0.90 -0.90
## 4 0.15 1.85 -0.85 -0.85
## 5 0.20 1.80 -0.80 -0.80
## 6 0.25 1.75 -0.75 -0.75
```

```
g1 = ggplot(mydf1, aes(x = x)) +
  geom_line(aes(y = y1), colour = 'blue') +
  geom_line(aes(y = y2), colour = 'green') +
  geom_ribbon(aes(ymin=y1, ymax=z), fill='gray80')
g1
```



Solution of B is feasible and unbounded