Ejercicio 1

Resolver gráficamente:

$$\max 20x_1 + 60x_2$$
$$30x_1 + 20x_2 \leq 2700$$
$$5x_1 + 10x_2 \leq 850$$
$$x_1 + x_2 \geq 95$$
$$x_i \geq 0, i = 1, 2$$

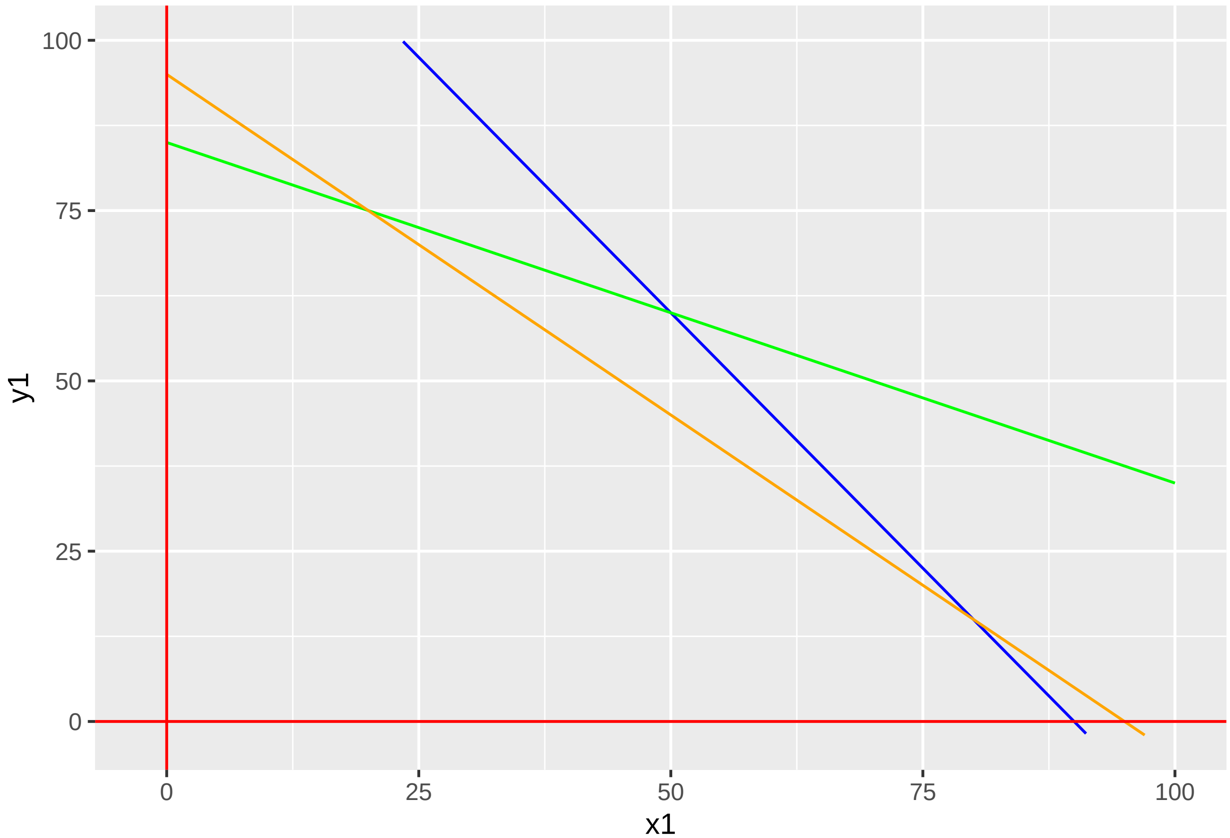
Así, debemos dibujar las rectas:

- $R1 : 30x_1 + 20x_2 = 2700$
- $R2 : 5x_1 + 10x_2 = 850$
- R3: $x_1 + x_2 = 95$

```
library (ggplot2)
```

```
R1 <- function (x) (2700 - 30*x)/20
R2 <- function (x) (850 - 5*x)/10
R3 <- function (x) 95-x
```

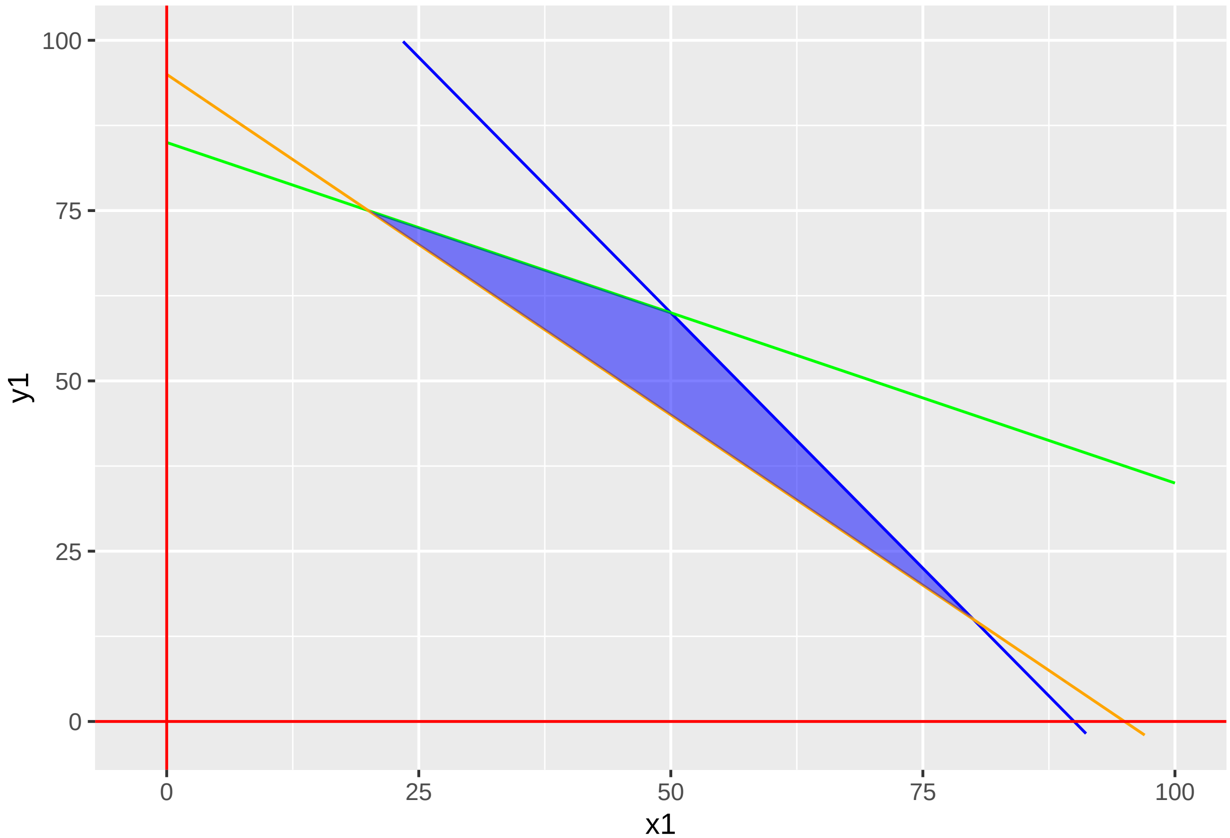
```
x1<- seq(0,100,length.out=500)
datos <- data.frame (x1, y1 = R1(x1), y2 = R2(x1), y3=R3(x1))
p <- ggplot(datos, aes (x = x1)) +
  geom_line(aes(y = y1), colour = "blue") +
  geom_line(aes(y = y2), colour = "green") +
  geom_line(aes(y = y3), colour = "orange") +
  geom_hline(yintercept = 0, colour ="red") +
  geom_vline(xintercept = 0, colour = "red") +
  ylim(-2,100)+
  xlim(-2,100)
  p
```



Y rellenamos **la región factible**, tras comprobar los planos definidos por las inecuaciones:

```
datos <-  transform(datos, z = pmax(y3,pmin(y1,y2)))
```

```
p +  geom_ribbon(data=datos,aes(ymin=y3,ymax = z), fill = 'blue',alpha=0.5)
```



Ahora tenemos que buscar las intersecciones:

```
A <- rbind(c(30,20), c(5,10))
b <- c(2700,850)
ptoR1R2 <- solve(A,b)
ptoR1R2
```

```
## [1] 50 60
```

```
A <- rbind(c(30,20), c(1,1))
b <- c(2700,95)
ptoR1R3 <- solve(A,b)
ptoR1R3
```

```
## [1] 80 15
```

```
A <- rbind(c(5,10), c(1,1))
b <- c(850,95)
ptoR2R3 <- solve(A,b)
ptoR2R3
```

```
## [1] 20 75
```

Por último comprobamos qué punto o puntos maximizan la función objetivo

```r
obj <- function(pto) 20*pto[1] + 60*pto[2]
obj(ptoR1R2)
```

```
## [1] 4600
```

```r
obj(ptoR1R3)
```

```
## [1] 2500
```

```r
obj(ptoR2R3)
```

```
## [1] 4900
```

Por tanto la solución es $Z = 4900$, $x_1 = 20$ y $x_2 = 75$