We can write $|x| \le a$ as $x \le a$ and,

1b/ Now ~~co~~ we consider the problem:

Suppose we have the problem.

Minimize $z = 2x_1 - 3x_2 + 6x_3$

subject to

$$x_1 + x_2 - x_3 \geq -6$$
$$-6x_1 + 7x_2 + 4x_3 = 15$$
$$|13x_1 - 4x_2 + 5x_3| \le 13$$

$x_1, x_2 \geq 0$, x_3 unrestricted in sign.

Reduce the problem into standard maximization form..

Ans: We can write $-6x_1 + 7x_2 + 4x_3 = 15$ as.

$$-6x_1 + 7x_2 + 4x_3 \geq 15$$
$$-6x_1 + 7x_2 + 4x_3 \le 15$$

and we can write $|13x_1 - 4x_2 + 5x_3| \le 13$

as $13x_1 - 4x_2 + 5x_3 \le 13$, $-13x_1 + 4x_2 - 5x_3 \le 13$

Now we can rewrite the problem in maximization form as.

~~Minimize $z = 2x_1 - 3x_2 + 6x_3$~~

Maximize $z' = -z = -2x_1 + 3x_2 - 6x_3$

~~subject to $x_1 + x_2 - x_3$~~

subject to.

$$-x_1 - x_2 + x_3 \le 6$$
$$-6x_1 + 7x_2 + 4x_3 \geq 15$$
$$-6x_1 + 7x_2 + 4x_3 \le 15$$
$$13x_1 - 4x_2 + 5x_3 \le 13$$
$$-13x_1 + 4x_2 - 5x_3 \le 13$$

$x_1, x_2 \geq 0$, x_3 unrestricted in sign.

Scanned with CamScanner

Since the decision variable x_3 is unrestricted in sign so we can ~~rewrite it in~~ write $x_3 = y_3 - y_4$ where $y_3, y_4 \geq 0$

We also write $x_1 = y_1, x_2 = y_2$

So we can rewrite the problem in standard maximization from as.

Maximize $z' = -z = -2y_1 + 3y_2 - 6y_3 + 6y_4 + 0.y_5 + 0.y_6 + 0.y_7 + 0.y_8 + 0.y_9$.

subject to

$$\cancel{-y_1 + y_2 + y_3 \quad y_4 \leq 6}$$

$$
\begin{aligned}
-y_1 + y_2 + y_3 - y_4 + y_5 &= 6 \\
-6y_1 + 7y_2 + 4y_3 - 4y_4 - y_6 &= 15 \\
-6y_1 + 7y_2 + 4y_3 - 4y_4 + y_7 &= 15 \\
13y_1 - 4y_2 + 5y_3 + y_8 &= 13 \\
-13y_1 + 4y_2 - 5y_3 + y_9 &= 13
\end{aligned}
$$

$y_1, y_2, y_3, y_4, y_5, y_6, y_7, y_8, y_9 \geq 0$.

y_5, y_7, y_8, y_9 slack variable.

y_6 surplus variable.