Example: Constraints : $-x + y \leq 2$

$-x + 2y \geq 2$

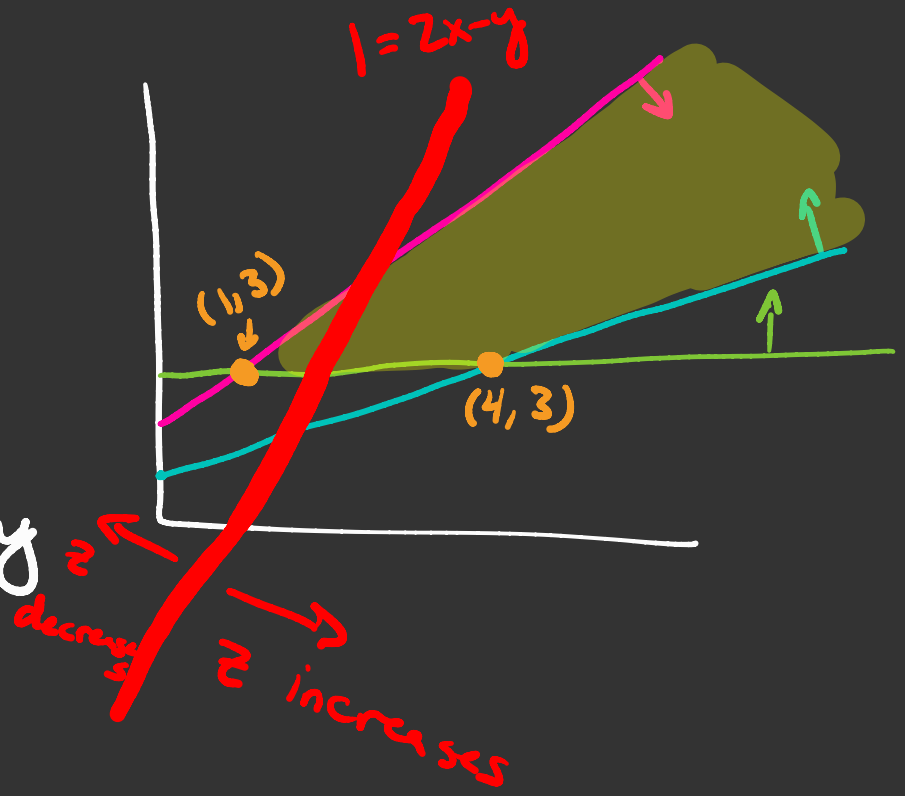
$y \geq 3$

Max/min the following functions w/ these constraints

a) $z = 2x - y$

$(1,3): z = -1$

$(4,3): z = 5$



Look at $1 = 2x - y$

Min: $z = -1$ at $(1,3)$

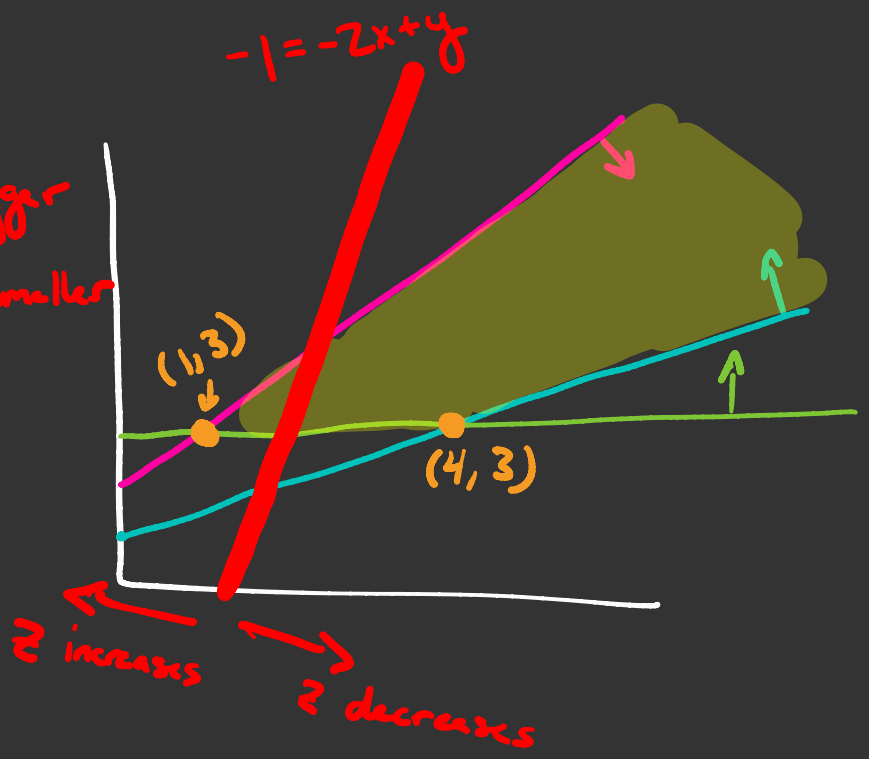
Max: None

b) $z = -2x + y$

$(1,3)$: $z = 1$ ← Bigger

$(4,3)$: $z = -5$ ← Smaller

Look at $-1 = -2x + y$



Min : None

Max: $z = 1$ at $(1,3)$

c) $z = 2x + y$

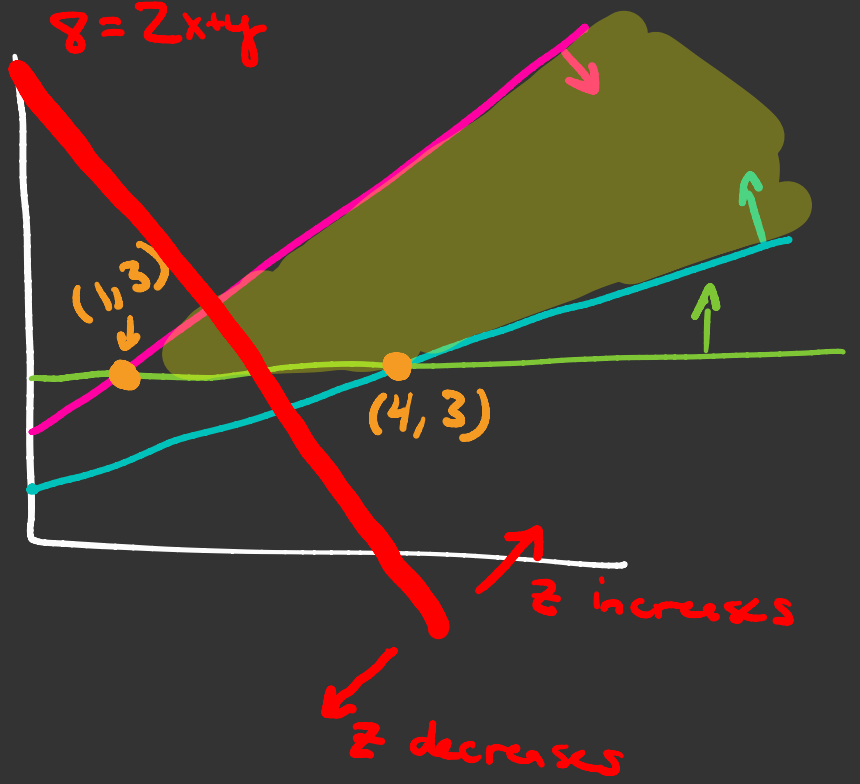
$(1,3)$: $z = 5$

$(4,3)$: $z = 11$

Look at $8 = 2x + y$

Min: $z = 5$ at $(1,3)$

Max: None



Matrices

Def: A matrix a rectangular array of numbers

Example: $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$

size 2×3

$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \\ 10 & 11 & 12 \end{bmatrix}$

size 4×3

The size of a matrix is (# rows) x (# columns)

We can define addition and multiplication with matrices

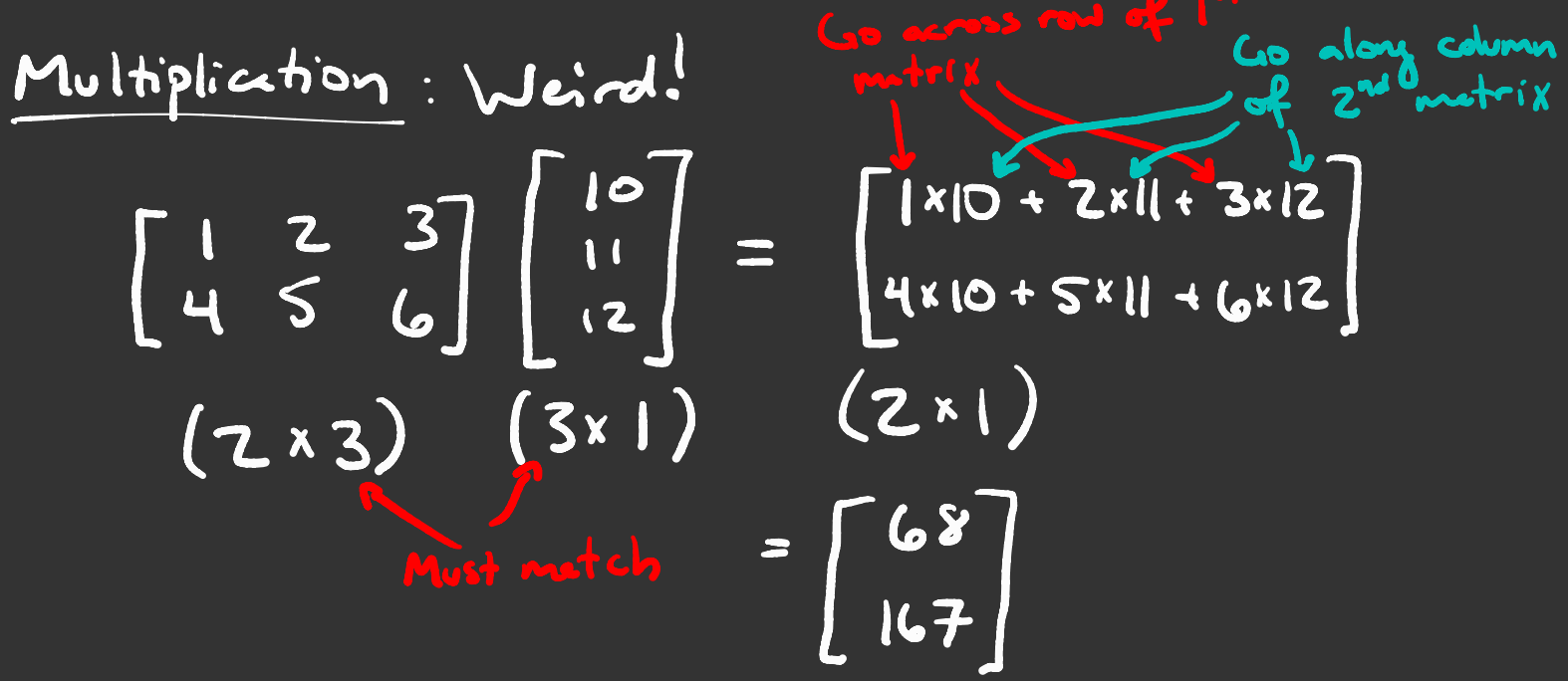
Addition

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix} + \begin{bmatrix} 10 & 11 \\ 12 & 13 \\ 14 & 15 \end{bmatrix} = \begin{bmatrix} 1+10 & 2+11 \\ 3+12 & 4+13 \\ 5+14 & 6+15 \end{bmatrix}$$

$$= \begin{bmatrix} 11 & 13 \\ 15 & 17 \\ 19 & 21 \end{bmatrix}$$

Matrices must be same size to add!

Multiplication : Weird!



To multiply : # colums of 1st matrix = # rows 2nd matrix !

Example: a)

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \cdot \begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} 1\times4+2\times2 & 1\times3+2\times1 \\ 3\times4+4\times2 & 3\times3+4\times1 \end{bmatrix}$$

(2×2) (2×2)

Match

(2×2)

$$= \begin{bmatrix} 8 & 5 \\ 20 & 13 \end{bmatrix}$$

b) $$\begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix}\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 4\times1+3\times3 & 4\times2+3\times4 \\ 2\times1+1\times3 & 2\times2+1\times4 \end{bmatrix}$$

$$= \begin{bmatrix} 13 & 20 \\ 5 & 8 \end{bmatrix}$$

Remark: It is not true in general that $AB = BA$ for matrices A and B