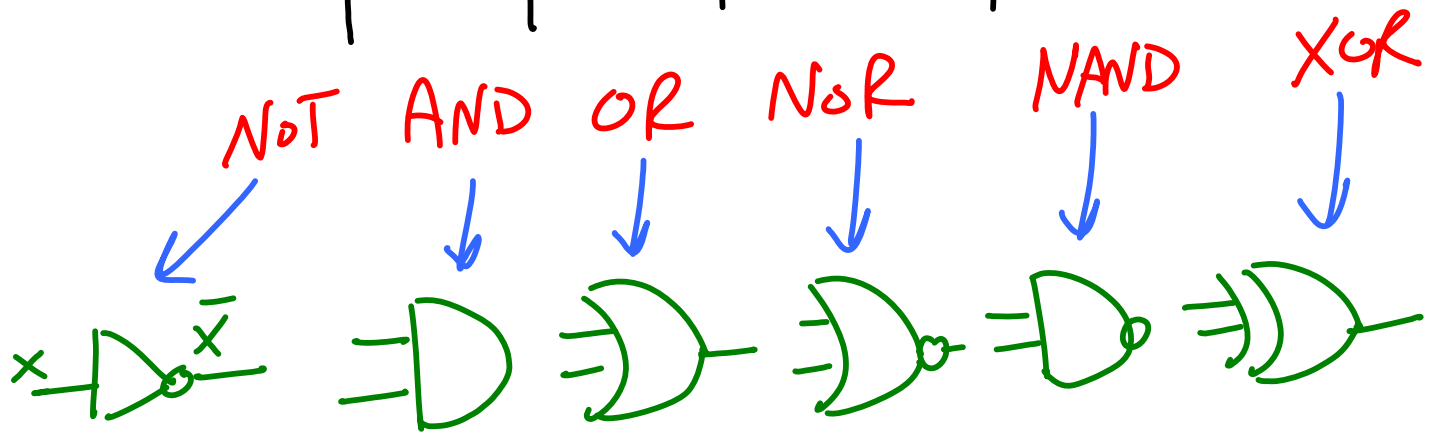


| X        | Y        | $\bar{X}$ | $XY$ | $X+Y$ | $\overline{X+Y}$ | $\overline{XY}$ | $X \oplus Y$ |
|----------|----------|-----------|------|-------|------------------|-----------------|--------------|
| <u>0</u> | <u>0</u> | 1         | 0    | 0     | 1                | 1               | 0            |
| <u>0</u> | <u>1</u> | 1         | 0    | 1     | 0                | 1               | 1            |
| <u>1</u> | <u>0</u> | 0         | 0    | 1     | 0                | 1               | 1            |
| <u>1</u> | <u>1</u> | 0         | 1    | 1     | 0                | 0               | 0            |



### Boolean Algebra

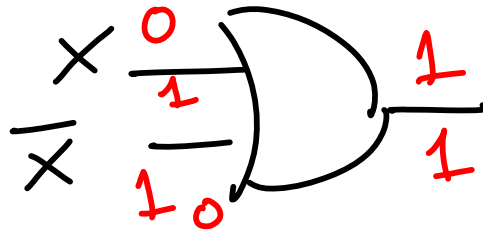
$$X + 0 = X$$

$$X + 1 = 1$$

$$X + X = X$$

$$\hookrightarrow XY + X\bar{Y} = X$$

$$X + \bar{X} = 1$$



$$X \cdot 0 = 0$$

$$X \cdot 1 = X$$

$$X \cdot X = X$$

$$X \cdot \bar{X} = 0$$

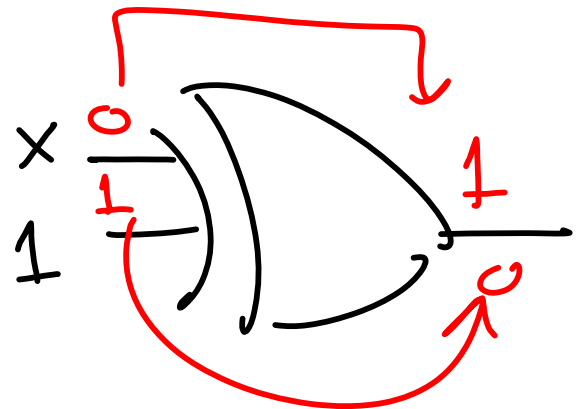

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$$X \oplus 0 = X$$

$$X \oplus 1 = \bar{X}$$

$$X \oplus X = 0$$

$$X \oplus \bar{X} = 1$$



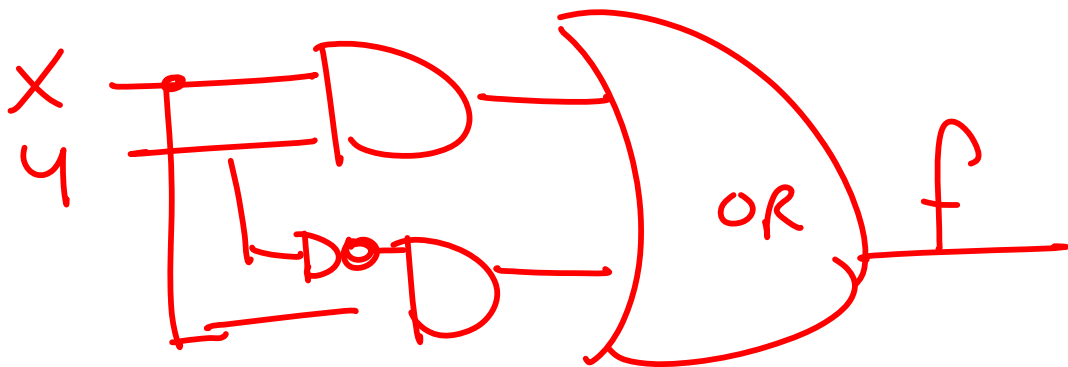
$$f = \overline{\overline{x}} = x$$

Ex

$$f = x \cdot 1 + x \cdot \overline{1}$$

$$= x (1 + \overline{1})$$

$$= x \cdot 1 = x$$



Ex

$$f = x + xy$$

$$= \boxed{(x + x)(x + y)}$$

$$= x(x + y)$$

$$= x + xy \leftarrow$$

Ex

$$F = x + \bar{x}y$$

$$f = (x + \bar{x})(x + y)$$

$$= x + y$$

| <u>Ex</u> |   |   |   |   |
|-----------|---|---|---|---|
| x         | y | z | f |   |
| 0         | 0 | 0 | 0 |   |
| 0         | 0 | 1 | 1 | ✓ |
| 0         | 1 | 0 | 0 |   |
| 0         | 1 | 1 | 1 | ✓ |
| 1         | 0 | 0 | 0 |   |
| 1         | 0 | 1 | 0 |   |
| 1         | 1 | 0 | 0 |   |
| 1         | 1 | 1 | 0 |   |

$$f = \underline{\bar{x}\bar{y}z} + \underline{\bar{x}yz}$$

Ex

| x | y | z | f   |
|---|---|---|-----|
| 0 | 0 | 0 | 0   |
| 0 | 0 | 1 | 0   |
| 0 | 1 | 0 | 1 ✓ |
| 0 | 1 | 1 | 1 ✓ |
| 1 | 0 | 0 | 0   |
| 1 | 0 | 1 | 0   |
| 1 | 1 | 0 | 0   |
| 1 | 1 | 1 | 1 ✓ |

$$f = \overline{x}y\overline{z} + \overline{x}yz + x y z$$

Ex

$$f = \overline{x} \overline{y} \overline{z} + \overline{x} \overline{y} z + \overline{x} y \overline{z} + \overline{x} y z + x \overline{y} \overline{z} + x \overline{y} z + x y \overline{z} + x y z$$

| x | y | z | f |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 |

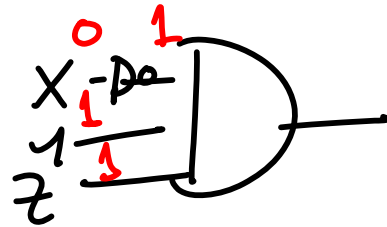
Ex  $f = \underline{\underline{\bar{x}y}} + \textcircled{xz}$

| x | y | z | f |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 |

$\bar{x}y(z + \bar{z})$

$\bar{x}yz + \bar{x}y\bar{z}$

$\textcircled{011} + \textcircled{010}$





Ex  $f = x + yz$

| x | y | z | f |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |

Ex

| x | y | z | f |
|---|---|---|---|
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 |

$$f = \bar{x}y + \bar{z}$$



$$(x + \bar{x})(y + \bar{y})\bar{z}$$

$$\overset{110}{x}y\bar{z} + \overset{100}{x}\bar{y}\bar{z}$$

$$\bar{x}y\bar{z} + \bar{x}\bar{y}z$$

$$010$$

$$001$$

Ex

| x | y | z | f |
|---|---|---|---|
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 |

$$f = \overline{z}$$

$$\begin{aligned} f = & \overline{x} \overline{y} \overline{z} \\ & + \overline{x} y \overline{z} \\ & + x \overline{y} \overline{z} \\ & + x y \overline{z} \end{aligned}$$

$$f = \overline{z}$$

Ex

| x | y | z | f |
|---|---|---|---|
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |

