$\boxed{1}$

$$\begin{cases} \bar{A} + A \cdot B = 0 \\ A \cdot C = A \cdot B \\ A \cdot B + A \cdot \bar{C} + C \cdot D = \bar{C} \cdot D \end{cases} \qquad \begin{cases} \bar{A} = 0 \wedge A . B = 0 \\ 1 \cdot C = 0 \\ 0 + 1 \cdot 1 + 0 \cdot D = 1 \cdot D \end{cases} \qquad \begin{cases} \bar{A} = 0 \wedge A = 1 \wedge B = 0 \\ C = 0 \\ D = 1 \end{cases}$$

Logo, $A = 1 \wedge B = 0 \wedge C = 0 \wedge D = 1$

$\boxed{2}$

a) $x + x \cdot y = x \cdot (1 + y)$

x	y	$x + x \cdot y$
0	0	0
0	1	0
1	0	1
1	1	1

b) $x + \bar{x} \cdot y = (x + \bar{x}) \cdot (x + y) = x + y$

x	y	$x + \bar{x} \cdot y$
0	0	0
0	1	1
1	0	1
1	1	1

c) $x \cdot y + x \cdot \bar{y} = x (y + \bar{y}) = x$

x	y	$x \cdot y$	$x \cdot \bar{y}$	$x \cdot y + x \cdot \bar{y}$
0	0	0	0	0
0	1	0	0	0
1	0	0	1	1
1	1	1	0	1

$\boxed{3}$

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

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

$$= \bar{x} \cdot \left[(\bar{y} \cdot (\bar{z} + z)) + (y \cdot (\bar{z} + z)) \right] + (x \cdot y)$$

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

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

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

$\boxed{4}$

Teorema do consenso

$$x \cdot y + \bar{x} \cdot z + y \cdot z = x \cdot y + \bar{x} \cdot z + (\bar{x} + x)(y \cdot z)$$
$$= \underbrace{xy + \bar{x}z + \bar{x}yz + xyz}$$
$$= xy + xyz + \bar{x}z + \bar{x}zy$$
$$= xy(\underbrace{1+z}_{1}) + (\bar{x}z)(\underbrace{1+y}_{1})$$
$$= x \cdot y + \bar{x} \cdot z$$

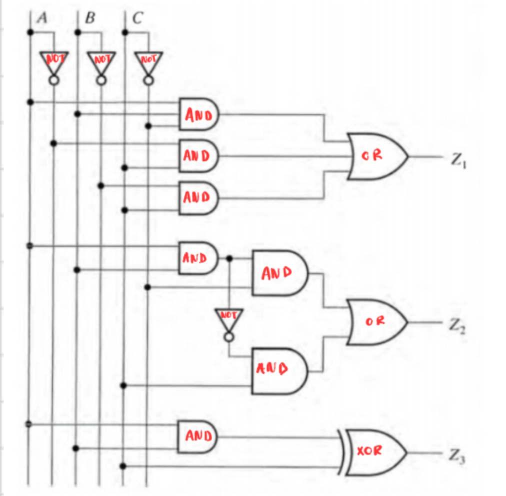
$\boxed{5}$

x	y	$x \oplus y$
0	0	0
0	1	1
1	0	1
1	1	0

$$x \oplus y = \underbrace{x'y + xy'}_{\text{Termos que dão 1}}$$

$\boxed{6}$ Provar que $Z_1 = Z_2 = Z_3$:

$$Z_1 = (A \cdot B \cdot \bar{C}) + (\bar{A} \cdot C) + (\bar{B} \cdot C)$$
$$Z_2 = (A \cdot B \cdot \bar{C}] + [(\overline{A \cdot B}) \cdot C]$$
$$Z_3 = (A \cdot B) \oplus C$$



$$Z_3 = (\overline{A \cdot B}) \cdot C + (A \cdot B) \cdot \bar{C}$$
$$= [(\overline{A \cdot B}) \cdot C] + [A \cdot B \cdot \bar{C}] = Z_2$$

$$Z_1 = [A \cdot B \cdot \bar{C}] + (\bar{A} \cdot C) + (\bar{B} \cdot C)$$
$$= [A \cdot B \cdot \bar{C}] + [(\bar{A} + \bar{B}) \cdot C]$$
$$= [A \cdot B \cdot \bar{C}] + [(\overline{A \cdot B}) \cdot C] = Z_2 = Z_3$$

$\boxed{7}$

(a) $\overline{(x\bar{y} + \bar{x}y)} = \overline{x\bar{y}} \cdot \overline{\bar{x}y} = (\bar{x} + y) \cdot (x + y) = y + (\bar{x} \cdot x) = y$

(b) $\overline{(xy + z(x + \bar{y}) + zy)} = \overline{xy} \cdot \overline{z(x+\bar{y})} \cdot \overline{zy}$

$$= (\bar{x} + \bar{y}) \cdot (\bar{z} + \overline{(x + \bar{y})}) \cdot (\bar{z} + \bar{y})$$
$$= (\bar{x} + \bar{y}) \cdot (\bar{z} + (\bar{x} \cdot y)] \cdot (\bar{z} + \bar{y})$$

$$= \left[\bar{x}\bar{z} + \bar{x}(\bar{x}y) + \bar{y}\bar{z} + \bar{y}(\bar{x}\cdot y)\right]\cdot(\bar{z}+\bar{y})$$

$$= \left[\bar{x}\bar{z} + y + \bar{y}\bar{z}\right]\cdot(\bar{z}+\bar{y})$$

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

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

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

$$= \bar{z}(\bar{x} + \bar{x} + \bar{y} + \bar{y} + 1)$$

$$= \bar{z}(\bar{x}\underbrace{(1+\bar{y})}_{1} + \bar{y}\underbrace{(\bar{x}+1)}_{1} + 1)$$

$$= \bar{z}(\bar{x} + \bar{y} + 1)$$

$\boxed{8}$

$$(\bar{a}b + ac)(a+\bar{b})(\bar{a}+\bar{c})$$

$$= (\bar{a}ab + \bar{a}b\bar{b} + aac + ac\bar{b})(\bar{a}+\bar{c})$$

$$= (ac + ac\bar{b})(\bar{a}+\bar{c})$$

$$= ac\bar{a} + ac\bar{c} + ac\bar{b}\bar{a} + ac\bar{b}\bar{c}$$

$$= 0 + 0 + 0 + 0 = 0$$

$\boxed{9}$

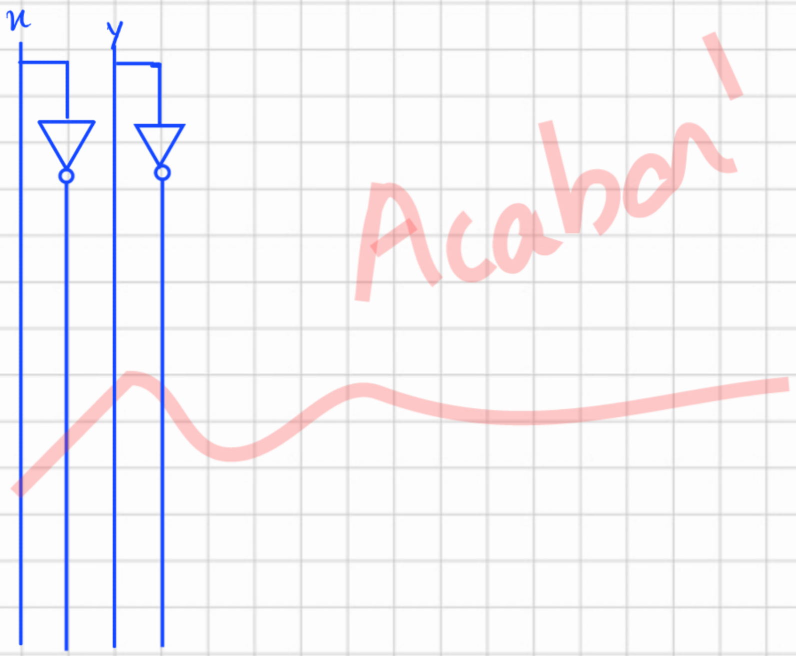
XOR → $x \oplus y = \bar{x}y + x\bar{y} = (\bar{x}+y)\cdot(x+\bar{y})$

XNOR → $\overline{x \oplus y} = \overline{\bar{x}y + x\bar{y}} = x\bar{y}\cdot\bar{x}y = (x+\bar{y})\cdot(\bar{x}+y)$

$\boxed{10}$

$x \oplus y = \bar{x}y + x\bar{y} = \overline{\overline{\bar{x}y + x\bar{y}}} = \boxed{\overline{x\bar{y}\cdot\bar{x}y}}$ → with NAND

$\boxed{11}$



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(a) $M(x,y,z)$

x	y	z	M
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

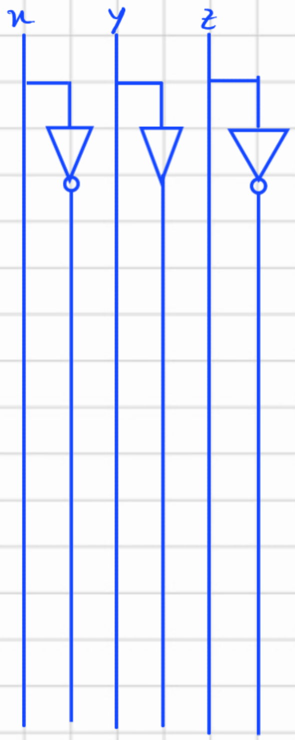
(b) $\boxed{M(x,y,z) = \bar{x}yz + x\bar{y}z + xy\bar{z} + xyz}$

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

Se $z=0$ a função é um and

$z=1$ é um or

(c)



Teste 1, experimentar

$$\boxed{[A\cdot(B+C)] + (B\cdot C\cdot\bar{D})} = [A+(B\cdot C)]\cdot(B+C+\bar{D})$$

$$\overline{\cancel{(A\cdot(\bar{B}\cdot\bar{C}))} + \cancel{(\bar{B}+\bar{C}+D)}} = [A+(B+C)]\cdot(B\cdot C\cdot\bar{D})$$

$$[\bar{A}+(\bar{B}\cdot\bar{C})]\cdot(\bar{B}+\bar{C}+D) = [\bar{A}\cdot(\bar{B}+\bar{C})] + (\bar{B}\cdot\bar{C}\cdot D)$$

$$[A+(B\cdot C)]\cdot(\bar{B}\cdot\bar{C}\cdot D) = [A\cdot(B+C)] + (\bar{B}+\bar{C}+D)$$

$$\overline{\left[A + (B\cdot C)\right] \cdot \left(B + C + \bar{D}\right)} = \left[\bar{A} \cdot (\bar{B} + \bar{C})\right] + (\bar{B} \cdot \bar{C} \cdot D)$$

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

	x	y	z	$x(y+\bar{z})$
0	0	0	0	0
1	0	0	1	0
2	0	1	0	0
3	0	1	1	0
4	1	0	0	1
5	1	0	1	0
6	1	1	0	1
7	1	1	1	1

$$(x \times \bar{y} \times \bar{z}) + (x\cdot y\cdot \bar{z}) + (x\cdot y\cdot z)$$
$$= x(\bar{y}\cdot\bar{z} + y\bar{z} + y\cdot z)$$
$$= x(\bar{z}(\cancel{\bar{y}+y}) + yz)$$
$$= x(\bar{z} + yz)$$

398 | 2 → 398, 0, 199
199 | 2 → 198, 1, 99
99 | 2 → 98, 1, 49
49 | 2 → 48, 1, 24
24 | 2 → 24, 0, 12
12 | 2 → 12, 0, 6
6 | 2 → 6, 0, 3
3 | 2 → 2, 1, 1
1 | 2 → 0, 1, 0

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49
8

$$2^9 \times 2^8 + 2^6 + 2^3 + 2^1 + 1 = 512 + 256$$

1
2
4
8
16
32
64
128
256
512