

3. $F(x,y,z) = \Sigma(1,2,3,4,5,7)$ using only NAND gates

$$= \overline{A}(0,6) = \overline{(x+y+z)}(\overline{x+y+z})$$

$$4 = (x+y+z) + (\overline{x+y+z})$$

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

$$= \overline{x}\overline{y}[\overline{z} + z] + \overline{x}y[\overline{z} + z] + z[\overline{x}\overline{y} + x\overline{y}]$$

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

$$= \overline{x}[\overline{y} + y] + \overline{x}\overline{y}z + x\overline{y}z$$

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

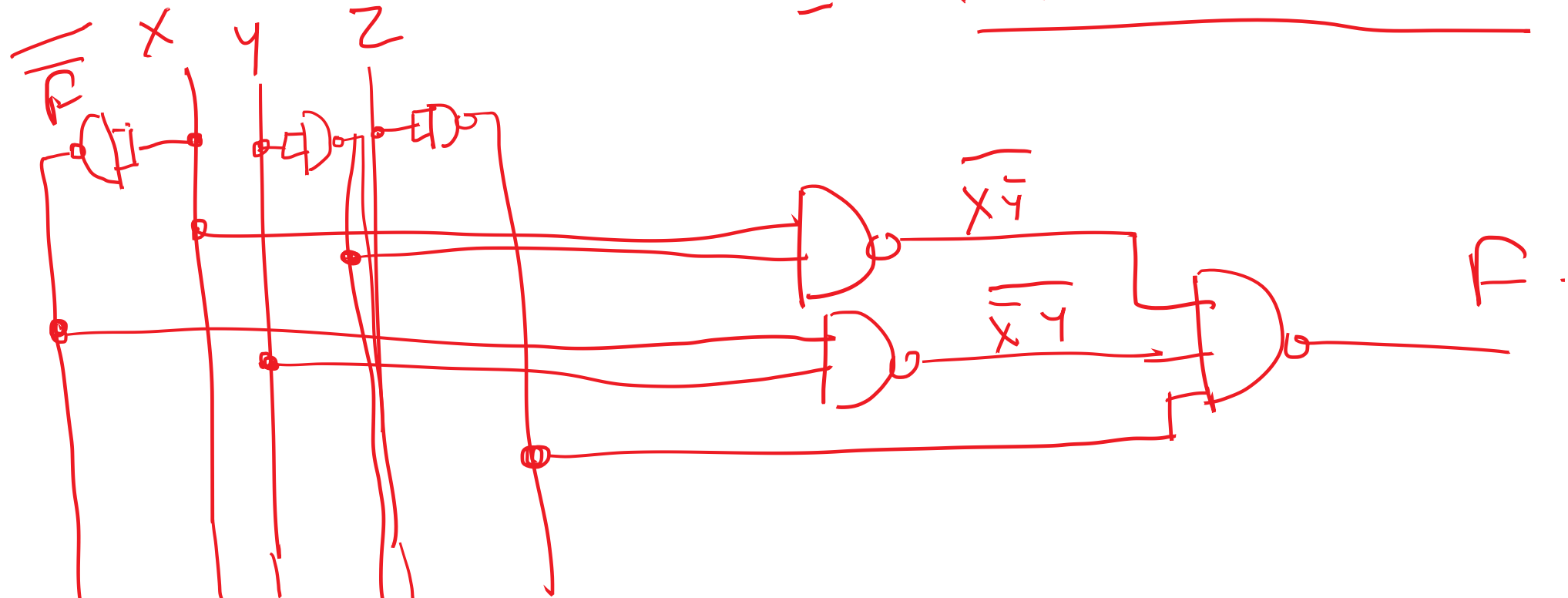
$$= \overline{x} + \overline{y}z$$

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

$$\overline{A+B} = \bar{A} \cdot \bar{B}$$

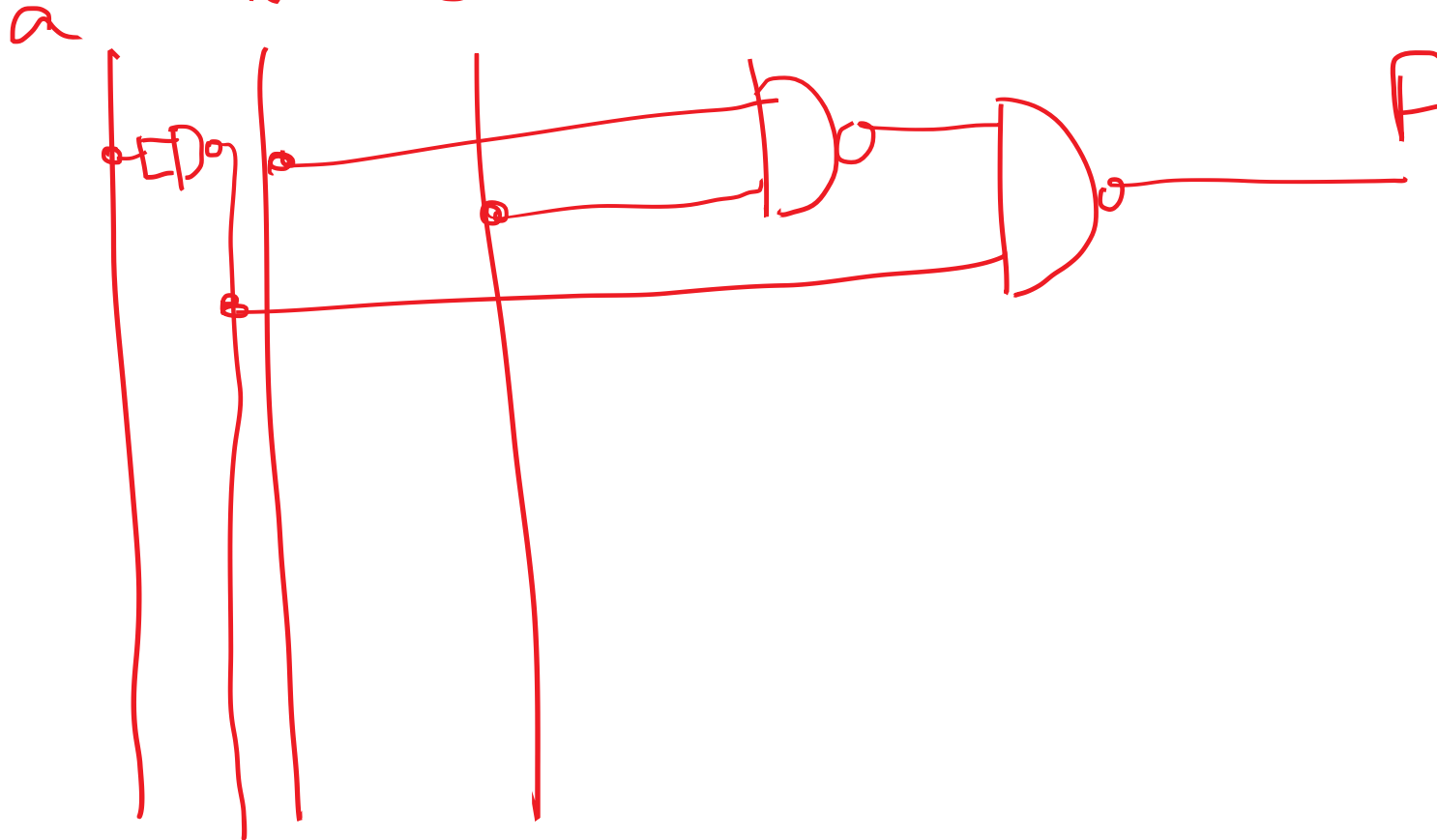
$$F = \overline{A \cdot B}$$

$$F = \overline{X \cdot Y + \bar{X} \cdot Y + Z} = \overline{X \bar{Y} + \bar{X} Y + Z} = \overline{X \bar{Y} \cdot \bar{X} Y \cdot Z}$$



4. $F(a,b,c) = a + bc$ using only NAND gates

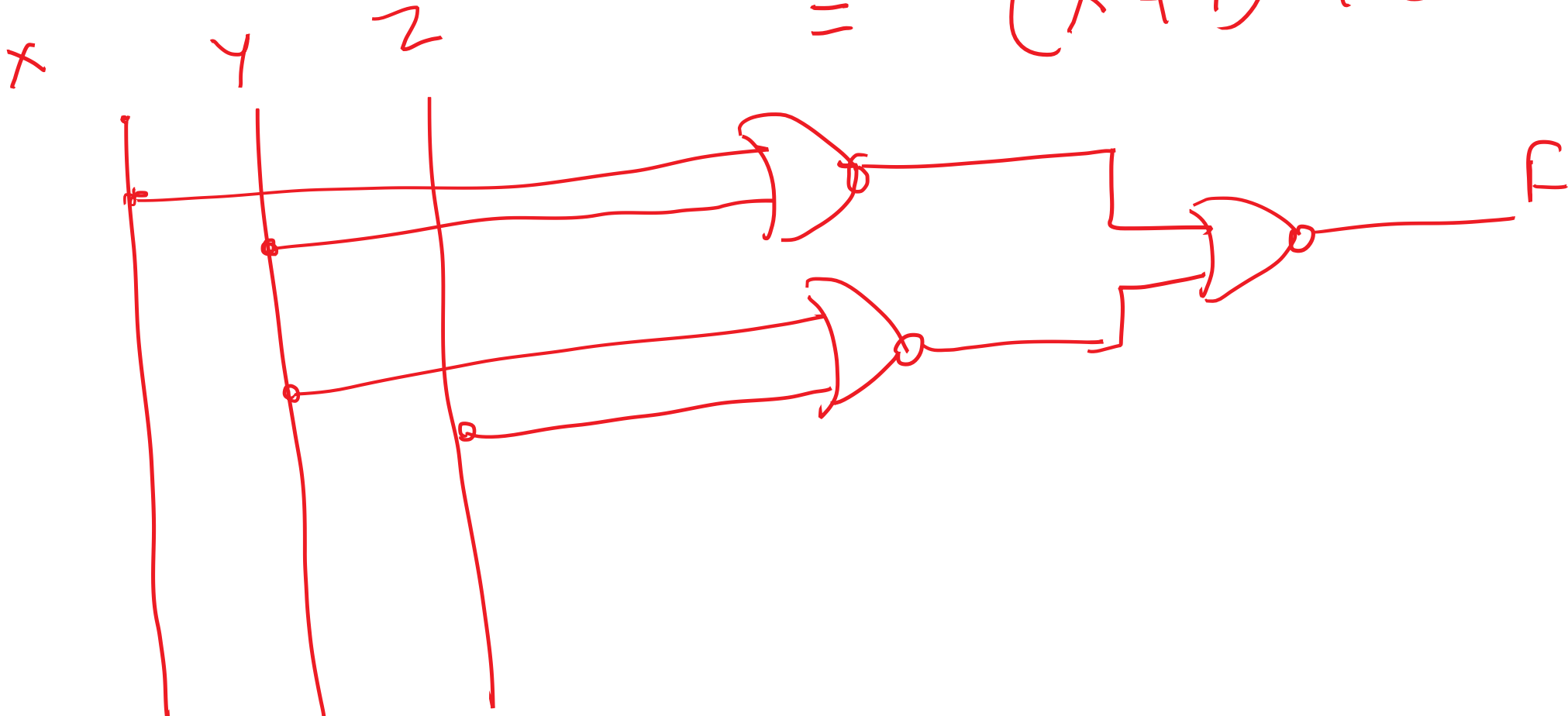
$$F = \overline{\overline{a + bc}} = \overline{\overline{a} \cdot \overline{bc}} \rightarrow$$



Drawing the circuits using only NOR gates

- 1. $F(x,y,z) = (x+y)(y+z)$ \rightarrow POS

$$\begin{aligned} &= \frac{(x+y)(y+z)}{(x+y) + (y+z)} \\ &= (x+y) + (y+z) \end{aligned}$$

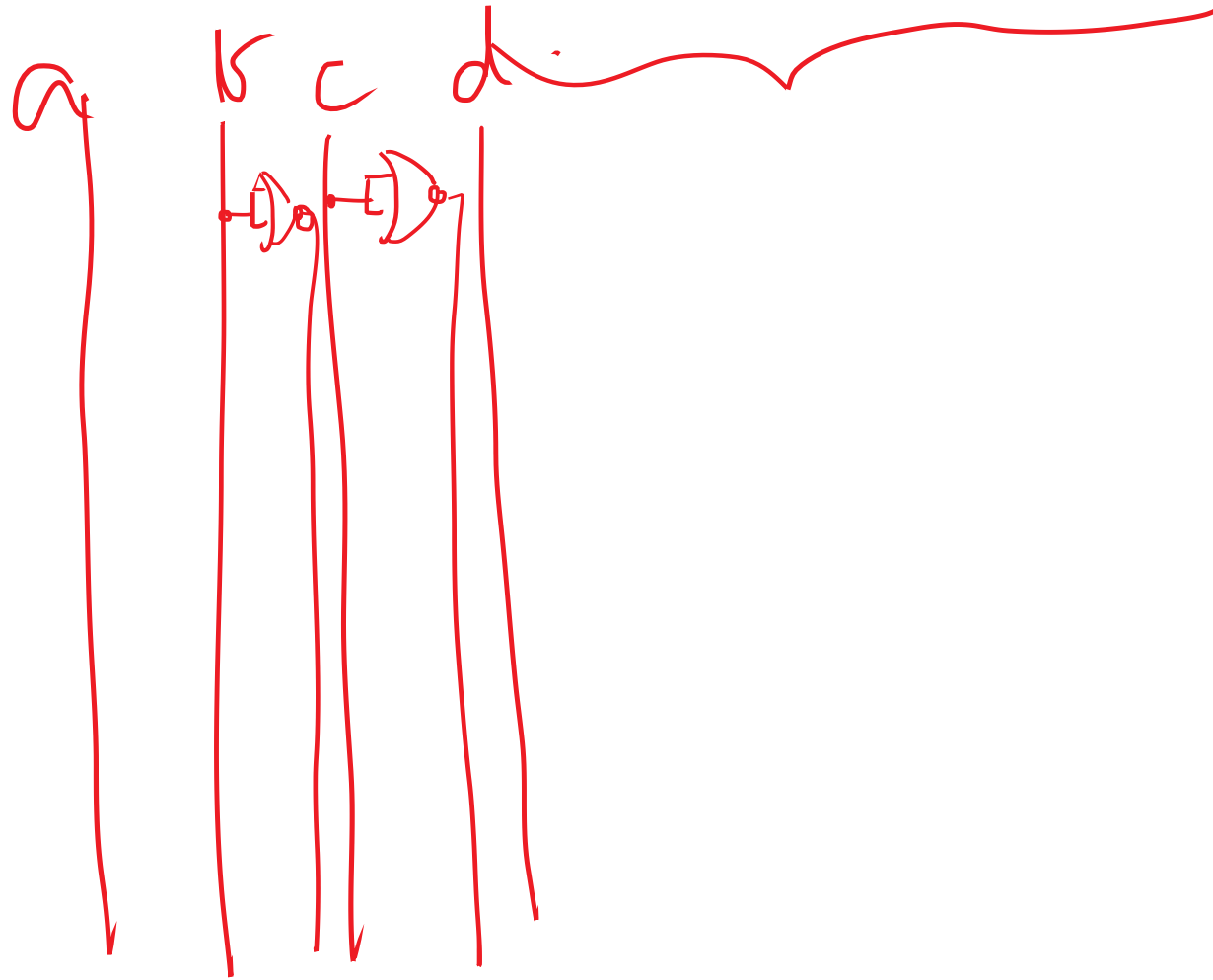


$$2. F(a, b, c, d) = \overline{(a+b')(c'+d)}$$

Using

NOR

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



3. $f(x,y,z) = \overline{x \cdot (y+z)}$ using NOR .

$= \overline{x} * \overline{(y+z)}$

$$4. f(a, b, c, d) = \overline{a \cdot b \cdot (c + d)}$$

using NOR -

$$= \overline{a} + \overline{b} + \overline{(c + d)}$$