

Dom Hall

2/16/22 Bonus Activity

1) a)  $B + \bar{A}\bar{B} = A \Rightarrow \bar{A} + \bar{B} = \bar{A}$  (T)

+ b)  $\begin{array}{c} \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{T} \\ \text{T} \\ \text{F} \\ \text{F} \\ \text{F} \end{array}$

c)  $\begin{array}{c} \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{T} \\ \text{T} \\ \text{F} \\ \text{F} \\ \text{F} \end{array}$

d)  $\begin{array}{c} \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{T} \\ \text{T} \\ \text{F} \\ \text{F} \\ \text{F} \end{array}$

e)  $\begin{array}{c} \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{T} \\ \text{T} \\ \text{F} \\ \text{F} \\ \text{F} \end{array}$

f)  $\begin{array}{c} \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{T} \\ \text{T} \\ \text{F} \\ \text{F} \\ \text{F} \end{array}$

g)  $\begin{array}{c} \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{T} \\ \text{T} \\ \text{F} \\ \text{F} \\ \text{F} \end{array}$

h)  $\begin{array}{c} \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{T} \\ \text{T} \\ \text{F} \\ \text{F} \\ \text{F} \end{array}$

i)  $\begin{array}{c} \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{T} \\ \text{T} \\ \text{F} \\ \text{F} \\ \text{F} \end{array}$

j)  $\begin{array}{c} \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{F} \\ \text{T} \\ \text{T} \\ \text{F} \\ \text{F} \\ \text{F} \end{array}$

$$\begin{array}{c} \bar{A} \cdot \bar{B} \\ \bar{A} \cdot \bar{B} = \bar{B} + \bar{A} = A + B \\ \bar{A} \cdot \bar{B} = \bar{A} + B \\ \bar{A} \cdot \bar{B} = \bar{A} + B \end{array}$$

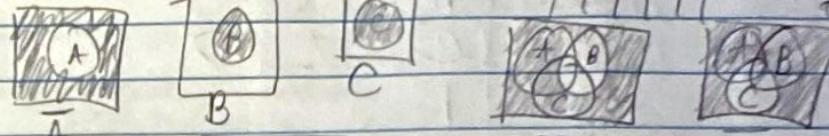
$(2 \cdot 3 + 2 \cdot 1) + 6 - 13$

$8 + 8 = 16 - 13 = 3$

$$\begin{array}{c} ab \\ \begin{array}{|c|c|c|c|c|} \hline c & 00 & 10 & 11 & 11 \\ \hline 0 & 0 & 0 & 0 & 0 \\ \hline 0 & 0 & 0 & 0 & 0 \\ \hline 1 & 0 & 0 & 1 & 0 \\ \hline \end{array} \end{array} \Rightarrow c \cdot b \cdot a + \bar{b}$$

$32161421 \\ 111111 = 63$

2)



$$= \begin{array}{|c|} \hline \text{A} \\ \hline \text{B} \\ \hline \text{C} \\ \hline \end{array}$$

$\bar{A}$

$$\Rightarrow \begin{array}{|c|} \hline \text{A} \cap \text{B} \\ \hline \text{C} \\ \hline \end{array} \Rightarrow \begin{array}{|c|} \hline \text{A} \cap \text{B} \\ \hline \text{C} \\ \hline \end{array}$$

$\bar{A} \bar{B} \bar{C}$

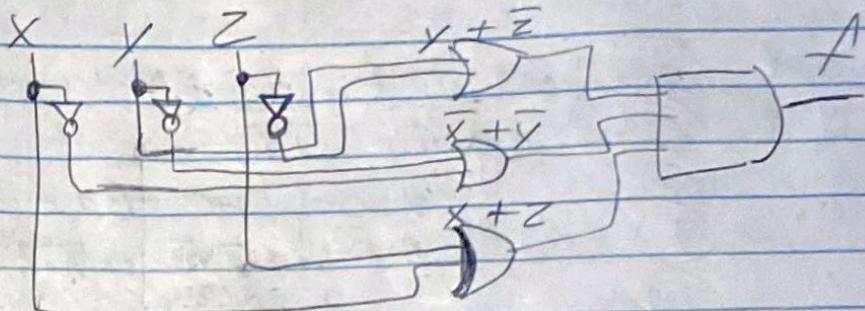
3)

| x | y | z | $x \oplus y$ | $x \oplus z$ | $\bar{A}$ | $\bar{B}$ | $\bar{C}$ |
|---|---|---|--------------|--------------|-----------|-----------|-----------|
| 0 | 0 | 0 | 0            | 0            | 0         | 0         | 0         |
| 0 | 0 | 1 | 0            | 1            | 0         | 1         | 0         |
| 0 | 1 | 0 | 1            | 0            | 0         | 1         | 1         |
| 0 | 1 | 1 | 1            | 1            | 1         | 0         | 1         |
| 1 | 0 | 0 | 1            | 1            | 1         | 1         | 1         |
| 1 | 0 | 1 | 1            | 0            | 1         | 0         | 0         |
| 1 | 1 | 0 | 0            | 1            | 0         | 0         | 1         |
| 1 | 1 | 1 | 0            | 0            | 0         | 0         | 0         |

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

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

c)



4) a)  $2 \cdot 6^2 + 5 \cdot 6^1 + 2 \cdot 6^0$   
 $\Rightarrow 72 + 30 + 2 = 104$

| Q   | R | $6^4 32 16 8 4 2 1$   |
|-----|---|-----------------------|
| 104 | 0 | $\Rightarrow 1101000$ |
| 52  | 0 |                       |
| 26  | 0 |                       |
| 13  | 1 |                       |
| 6   | 0 | $\Rightarrow$         |
| 3   | 1 |                       |
| 1   | 1 |                       |
| 0   |   |                       |

| Q   | R | $6^4 32 16 8 4 2 1$      |
|-----|---|--------------------------|
| 684 | 0 | $\Rightarrow 1010101100$ |
| 342 | 0 |                          |
| 171 | 1 |                          |
| 85  | 1 |                          |
| 42  | 0 |                          |
| 21  | 1 |                          |
| 10  | 0 |                          |
| 5   | 1 |                          |
| 2   | 0 |                          |
| 1   | 1 |                          |
| 0   |   |                          |

$$16 \cdot 16 = 256 \cdot 16 \quad \begin{array}{r} 2560 \\ + 1536 \\ \hline 4096 \end{array} \cdot 10 = 51,960$$

c) 3210  
1 ADF

$$10 \cdot 16^3 + 10 \cdot 16^2 + 13 \cdot 16 + 15$$

$$40,960 + 2560 + 208 + 15 \Rightarrow$$

40460

2660

7 223  
513743

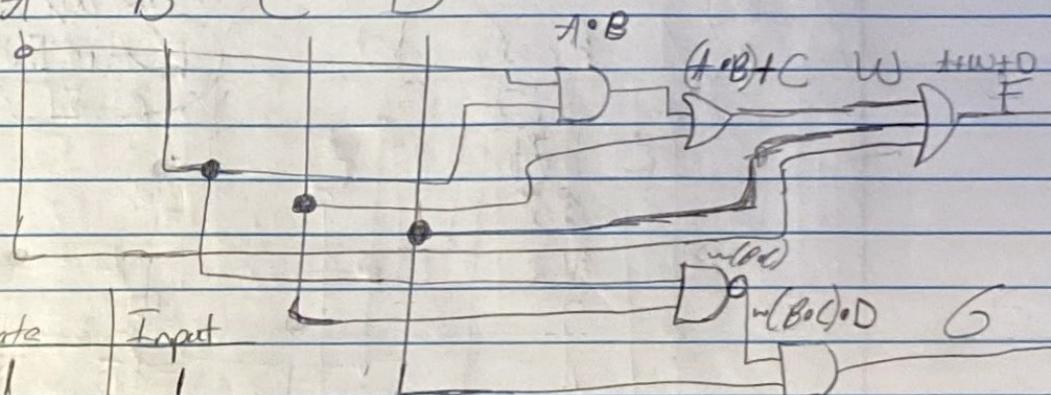
I did all this wheat  
calculator, but getting  
this into actual wheat  
a calculator would be horrible

|       |   |
|-------|---|
| G     | K |
| 53793 | 7 |
| 5467  | 3 |
| 683   | 3 |
| 85    | 5 |
| 10    | 2 |
| 1     | 1 |

1253378

d)  $100011001 \Rightarrow 256 + 16 + 8 + 1 = 281_{10}$

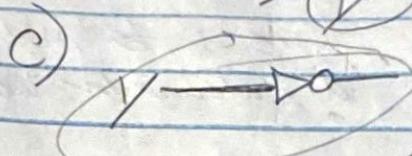
5) A B C D



| b)                  | Gate | Input |
|---------------------|------|-------|
| $B \cdot \bar{C}$   | 1    | 1     |
| $A \cdot B$ :       | 1    | 2     |
| $(A \cdot B) + C$   | 1    | 3     |
| $F$                 | 1    | 3     |
| $B \cdot C$ :       | 1    | 2     |
| $B \cdot C \cdot D$ | 1    | 2     |

$$6) a) f(x,y) = \overline{xy} \cdot \overline{y} \cdot \overline{x+y}$$

$$\begin{aligned} b) &\Rightarrow x \cdot (\overline{y} \cdot \overline{y}) = x \cdot \overline{y+y} \\ &\Rightarrow x \cdot \overline{x+y} \\ &\Rightarrow x \cdot \overline{\overline{x} \cdot y} \\ &\Rightarrow \overline{x} \cdot x \cdot \overline{y} \\ &\Rightarrow \overline{y} \end{aligned}$$

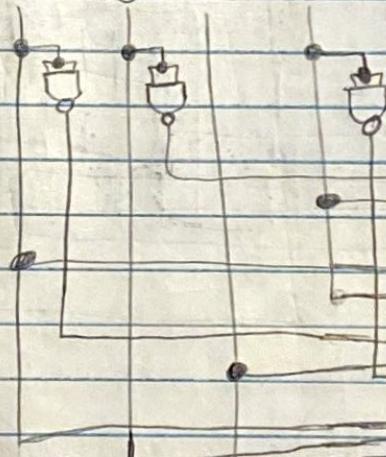


|    | ABD | $\bar{A}C\bar{D}$ | $\bar{A}\bar{B}D$ | $A\bar{B}D$ | $B\bar{C}\bar{D}$ |
|----|-----|-------------------|-------------------|-------------|-------------------|
| a) | AB  | 11-1              | 0-10              | 00-1        | 10-1-110          |
|    | CD  | 00 01 11 10       | 00 01 00 00       | 01 10 11 11 | 11 11 00 11       |
|    | 00  | 0 0 0 0           | 0 0 0 0           | 1 1 1 1     | 1 1 1 1           |
|    | 01  | 1 0 0 0           | 0 1 1 1           | 0 0 0 0     | 0 0 0 0           |
|    | 11  | 1 1 0 0           | 0 1 1 1           | 1 1 1 1     | 1 1 1 1           |
| b) | 10  | 1 1 1 0           | 1 1 1 0           | 0 0 0 0     | 0 0 0 0           |

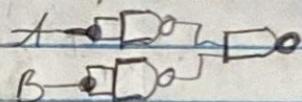
$$\Rightarrow \overline{BD} + AD + \overline{ACD} + ABC$$

c)

A B C D



OR w/ NAND



$\overline{BD}$

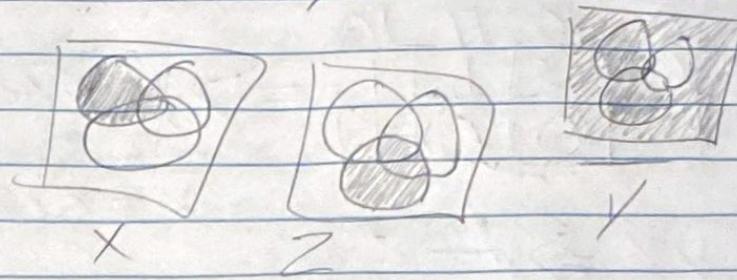
$\overline{AD}$

$\overline{FC\bar{D}}$

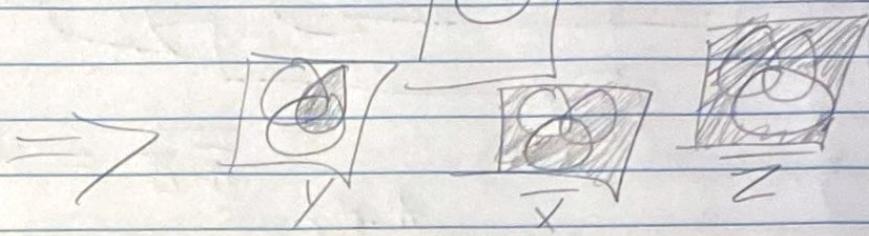
$\overline{ABC}$

$\overline{BD}$

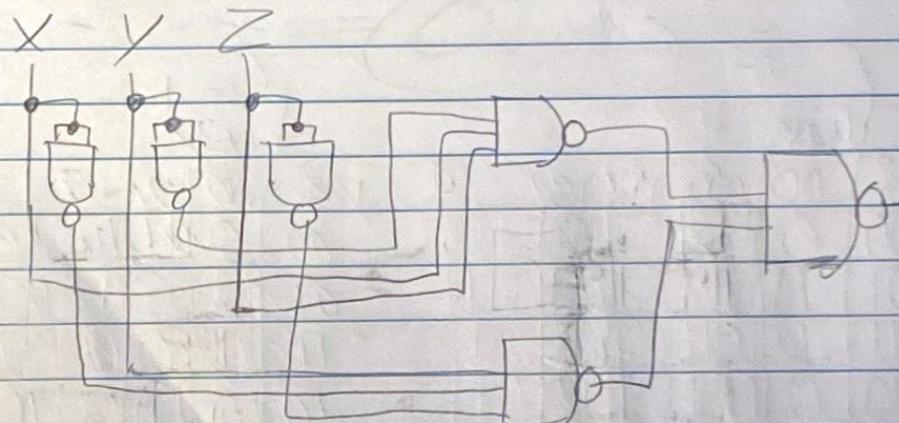
$$8) a) x \cdot z \cdot \bar{y} + y \cdot \bar{x} \cdot z$$



$$\Rightarrow$$



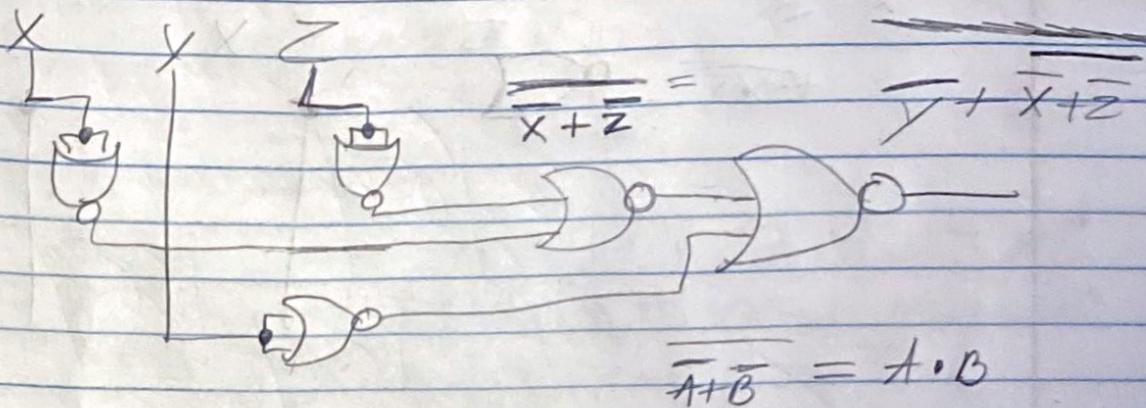
$$\Rightarrow$$



b)

|   | xy |    |    |    |   |
|---|----|----|----|----|---|
| z | 00 | 10 | 11 | 10 |   |
| 0 | 00 | 01 | 11 | 11 | $\Rightarrow y \cdot \bar{x} \cdot \bar{z}$ |
| 1 | 00 | 01 | 01 | 11 |   |

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



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

AND w/ NOR  $\Rightarrow$  

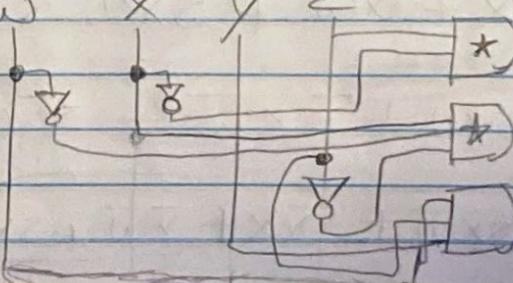
9) a) b)

|    | wx |    |    |    |
|----|----|----|----|----|
| z  | 00 | 01 | 11 | 10 |
| 00 | 0  | 1  | 0  | 0  |
| 01 | 1  | 0  | 0  | 1  |
| 11 | 1  | 0  | 0  | 1  |
| 10 | 0  | 1  | 0  | 1  |

|    | wx |    |    |    |
|----|----|----|----|----|
| yz | 00 | 01 | 11 | 10 |
| 00 | 0  | 1  | 1  | 0  |
| 01 | 1  | 0  | 0  | 1  |
| 11 | 1  | 0  | 1  | 1  |
| 10 | 0  | 1  | 0  | 0  |

$$\Rightarrow \star \bar{x}z + \bar{w}x\bar{z} + wyz$$

c) w x y z



$$\begin{aligned}
 10) & \overline{xy}(\overline{z} + \overline{z}(\overline{w} + \overline{w}) + (\overline{y} + \overline{z}) \cdot (\overline{y} + \overline{y}z) \cdot (\overline{wx}) \\
 & + \overline{wx}y + yxz \cdot (\overline{z} + \overline{zy}) \quad x \quad y \\
 \Rightarrow & \overline{x} + \overline{y}(\overline{z} + (\overline{z}(\overline{w} + \overline{w}))) + (\overline{y}\overline{z}) + (\overline{y} \cdot \overline{yz}) + (\overline{w} + \overline{x}) \\
 & + \overline{wx}y + yxz \cdot (\overline{z} \cdot \overline{zy}) \\
 \Rightarrow & \overline{x} + \overline{y} + (\overline{y} \cdot \overline{z}) + (\overline{y}\overline{yz}) + (\overline{w} + \overline{x}) + \overline{wx}y + yxz \cdot y \\
 \Rightarrow & \overline{x} + \overline{y} + \overline{yz} + (\overline{y} \cdot \overline{y} + \overline{z}) + (\overline{w} + \overline{x}) + \overline{wx}y + yxz \cdot y \\
 \Rightarrow & \overline{x} + \overline{y} + (\overline{yz} + \overline{z}) + (\overline{w} + \overline{x}) + \overline{wx}y + yxz \cdot y \\
 \Rightarrow & \overline{x} + \overline{y} + \overline{z} + \overline{w} + \overline{x} + \overline{wx}y + yxz \cdot y \\
 \Rightarrow & \overline{y} + \overline{z} + \overline{w} + \overline{y} + \overline{x} + \overline{y} + \overline{z} + \overline{y} + \overline{z} + \overline{y} \cdot y \\
 \Rightarrow & \overline{y} \cdot y = \textcircled{0}
 \end{aligned}$$