Combinational Design

You and your friends are trying to find a luxury apartment for senior year. The apartment should meet the following requirements:

1. The apartment complex should at least have a pool or fireplace.
2. It shouldn’t be near McDonald’s unless it has a gym.
3. It should have a pool if it has a gym.

Write a boolean expression, \( L \), that evaluates to true for any combination of requirements that would make it a suitable apartment for your senior year.  

(Use \( P = \text{Has a pool} \), \( F = \text{Has a fireplace} \), \( M = \text{Is near McDonald’s} \), \( G = \text{Has a gym} \).) A blank truth table is provided for your convenience.

\[ L = \]
Design the gates

Represent your boolean logic from the previous question using logic gates and the same parameters as input wires.

Find boolean logic which can be simplified using NAND or NOR gates and circle them in your gates diagram above.
A peek at Bit-wise fun

Figure out the result to following operations and why that happens. Assume x, y and z are 32 bit integers.

- \( x \oplus 0 = \)

- \( x \oplus 1 = \)

- \( x \oplus x = \)

- \( x \oplus y \oplus z \oplus y \oplus x = \)

- \( x \oplus x' = \)