

In the following questions, the notation $\sum m(x_1, \dots, x_j)$ indicates a Boolean function that is the sum of the minterms x_1, \dots, x_j , where x_i is the i th minterm in canonical ordering — i.e., the i th row of the truth table where the input values are ordered as binary numbers. Similarly,

$$\sum m(x_1, \dots, x_j) + d(y_1, \dots, y_k)$$

indicates a Boolean function that is the sum of the minterms x_1, \dots, x_j and whose values for rows y_1, \dots, y_k of the truth table are *don't cares*.

Minimize the following functions using Karnaugh maps. Then, write down a Boolean formula in sum-of-products or product-of-sums form for each function. Show your work (including the Karnaugh maps).

1. $f(A, B, C) = \sum m(2, 3, 4, 5)$
2. $f(A, B, C, D) = \sum m(0, 1, 4, 6, 9, 13, 14, 15)$
3. $f(A, B, C, D) = \sum m(0, 1, 2, 8, 9, 10, 11, 12, 13, 14, 15)$
4. $f(A, B, C, D) = \sum m(2, 9, 10, 12, 13) + d(1, 5, 14)$
5. $f(A, B, C, D) = \sum m(1, 3, 6, 7) + d(4, 9, 11)$



