Name_____

Partial credit will be given if you show your work.

1. (20 pts.) Use a Karnaugh map to determine a SOP and POS expressions for the function $f(x1, x2, x3, x4) = \sum m(2,4,5,6,10) + D(12,13,14,15)$

2. (20 pts.) Convert the two decimal numbers into signed 8-bit numbers in the following representations

Decimal	Sign and Magnitude	2's complement
73		
-95		

3. (20 pts.) Perform the following operations involving 8-bits 2's complement numbers, and indicate whether an arithmetic overflow, negative, or zero result occurs in each case.

$$\begin{array}{r} 01110101 \\ + \ 11011110 \\ \hline \end{array} \qquad \begin{array}{r} 01110101 \\ - \ 11010110 \\ \hline \end{array}$$

4. (20 pts.) How many gate delays are required to compute a sum in an n-bit *ripple carry adder*? How many gate delays are required for an n-bit *carry-lookahead adder*?