

NAME: _____

(All questions worth 10 points.)

1. Prove that:

$$\sum_{i=1}^n (4i + 1) = 2n^2 + 3n$$

2. Find a Boolean Expression for the following function f .

A	B	C	D	f
T	T	T	T	T
T	T	T	F	T
T	T	F	T	F
T	T	F	F	F
T	F	T	T	F
T	F	T	F	F
T	F	F	T	F
T	F	F	F	F
F	T	T	T	T
F	T	T	F	T
F	T	F	T	F
F	T	F	F	T
F	F	T	T	F
F	F	T	F	T
F	F	F	T	T
F	F	F	F	F

3. Multiply the following matrices.

$$\begin{pmatrix} 2 & 2 \\ 3 & 1 \\ 1 & 3 \end{pmatrix} \begin{pmatrix} 3 & 2 & 1 \\ 1 & 1 & 1 \end{pmatrix}$$

4. Multiply the following matrices.

$$\begin{pmatrix} 0 & 1 & 0 \\ 2 & 1 & 1 \\ 3 & 2 & 1 \end{pmatrix} \begin{pmatrix} 1 & 2 & 2 \\ 3 & 0 & 1 \\ 2 & 1 & 1 \end{pmatrix}$$

5. Combine the following permutations as indicated. Remember that $(f \circ g)(x) = f(g(x))$.

$$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 1 & 4 & 5 & 3 \end{pmatrix} \circ \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 5 & 2 & 1 & 4 & 3 \end{pmatrix}$$

6. Combine the following permutations as indicated.

$$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 3 & 4 & 7 & 2 & 1 & 5 & 6 \end{pmatrix} \circ \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 4 & 1 & 5 & 7 & 6 & 2 & 3 \end{pmatrix}$$

7. Give the addition and multiplication tables for Modulo 8.

Addition:

+	0	1	2	3	4	5	6	7
0								
1								
2								
3								
4								
5								
6								
7								

7. Continued
Multiplication:

\times	0	1	2	3	4	5	6	7
0								
1								
2								
3								
4								
5								
6								
7								

8. Prove the following algebraically: $(x+1)(x-2) = x^2 - x - 2$. Apply one law at a time, and at each step *apply only one law*.

9. Prove the following:
 $(A \cap B) \subseteq (A \cup B)$

10. Prove that the following is true for all integers a .
 $a \bullet 0 = 0$