MTH310 QUIZ 1 SOLUTIONS

1. Use a truth table to verify the statements:

I. -(p or q) $\iff$ -p and -q

p	q	p or q	-(p or q)	-p	-q	(-p and -q)
T	T	T	F	F	F	F
T	F	T	F	F	T	F
F	T	T	F	T	F	F
F	F	F	T	T	T	T

II. (p $\implies$ q and q $\implies$ r) $\implies$ (p $\implies$ r)

p	q	r	p $\implies$ q	q $\implies$ r	p $\implies$ q and q $\implies$ r	p $\implies$ r	(p $\implies$ q and q $\implies$ r) $\implies$ (p $\implies$ r)
T	T	T	T	T	T	T	T
T	F	F	F	T	F	F	T
T	T	F	T	F	F	F	T
T	F	T	F	T	F	T	T
F	T	T	T	T	T	T	T
F	F	F	T	T	T	T	T
F	T	F	T	F	F	T	T
F	F	T	T	T	T	T	T

2. Prove that 64 is a factor of 9^n-8n-1 for every nonnegative integer n.

Proof:

(1) 64 is a factor of 9^n-8n-1 for every nonnegative integer n.

Let n=0, 9^n-8n-1=1-0-1 = 0 = 0* 64, then (1) is true at n=0

Assume (1) is true at n=k, then we have 9^k-8k-1= 64m ($m \in \mathbb{Z}$)

for n=k+1, 9^{k+1}-8(k+1)-1=9^k*9-8k-9=9*(9^k-1)-8k

=9*(64m+8k)-8k=9*64m+64k=64*(9m+k)

Since $m \in \mathbb{Z}$, $k \in \mathbb{N}$, we have $9m + k \in \mathbb{Z}$,

(1) is true at n=k+1

Thus, 64 is a factor of 9^n-8n-1 for every nonnegative integer n.