H|W

Q1

Proof by contradiction

let:

$ax + by = 1$ for integers x and y

since n divides a, and b:

$a = np$, for integers p and q
$b = nq$

Thus:

$1 = ax + by = anp + bnq$

$1 = n(ap + bq)$

so we get n divides 1 which is a contradiction since $n \geq 2$

Base case should be n = 1 since we are told to prove for n>= 1

This is not induction

Q2

The given recurrence relation is :

$T(n) = n \cdot T(n-1) + 1, \quad T(0) = 0.$

Proof:

$T(n) = n \cdot T(n-1) + 1$

put $n = n-1$, $\quad T(n-1) = (n-1)T(n-2) + 1$

substitute the value of $T(n-1)$

$T(n) = n(n-1)T(n-2) + n + 1$

put $n = n-2$

$T(n-2) = (n-2)T(n-3) + 1$

substitute the value of $T(n-2)$,

$T(n) = n(n-1)(n-2)T(n-3) + n(n-1) + n + 1$

~~put k=n~~

~~$T(n) =$~~

$\Rightarrow T(n) = n(n-1)(n-2)\ldots(n-(k-1))T(n-k) +$
$n(n-1)(n-2)\ldots$

put $k = n$

$\Rightarrow T(n) = n(n-1)(n-2)\ldots 2 \cdot 1)T(0) +$
$n(n-1)(n-2)\ldots 3) + \ldots n(n-1) + n + 1$

since $T(0) = 0$

$T(n) = n!/1! + n!/2! + \ldots n!/(n-2)!$
$+ n!/(n-1)! + n!/n!$

so, $T(n) = \sum_{m=1}^{n} \frac{n!}{m!}$

Q3

Proof by Induction

What is your predicate?

$(1+3)^2 > \frac{2}{3} + 6$

$16 > \frac{20}{3}$, hence it's true for $n=1$

let's assume it's true for $n=k$,

$(1+3)^{2k} > 2k/(2k+1) + 6k$

You should use a stronger predicate: (1 + 3)^(2k) >= 1 + 6k. **-2**

for $n=k+1$,

$(1+3)^{2k+2} > \frac{2k+2}{2(k+1)+1} + 6$

$16(1+3)^{2k} > \frac{2k+2}{2k+3} + 6k$

Unclear how you got to here from the line above. This is why using a stronger predicate would be helpful (easier inductive step). **-2**

hence proved !

You never state what the predicate P is that you're proving

Performing induction on wrong variable **0**

No invariant **0**

Q4

Proof by Induction

Base case: $P(3)$ is true becau[se] 6 computers and we can turn on the 3 on the left and 3 on the right.

Wrong base case **0**

Assume $P(K)$ is true for some integer $K>3$

$P(K+1) = 2(K+1) = 2K+2$ computers

Since K is odd, $2K+2$ is even.

Wrong inductive step **0**

Thus $P(2K+1)$ is true by inductio[n] true for all odd integers $n>3$

You must perform induction on the number of switches, not the number of computers. The number of computers is constant.