**Question 1**

a) Let be the statement

**Basis Clause**

Show that

is where

.

Therefore, is true

**Inductive Hypothesis**

Show that.

is where

Assume

**Inductive Step**

If is true, then must also be true

Assume

But,

Therefore, by the induction hypothesis:

Thus, is true

Hence, is true

It then follows by mathematical induction that is true.

b) Let be the statement

**Basis Clause**

Show that

is where

and

Therefore, is true

**Inductive Hypothesis**

Show that

is where

Assume

**Inductive Step**

If is true, then must also be true

Assume

But,

Therefore, by the induction hypothesis:

Re-write 4 as 3+1

Multiplying out

By regrouping

Remove from both sides

is true for all

Thus, is true

Hence, is true

It then follows by mathematical induction that is true for

**Question 2**

a)