1 Symbolize

Definitions:
$C(x)$ x is a cat
$D(x)$ x is a dog
$S(x, y)$ x has been seen by y
$B(x, y)$ x has bitten y
$T(x, y)$ x is taller than y

a)

No dog bites any cat that sees it
There does not exist a dog which bites a cat who sees the dog
There does not exist a dog who has both been seen by and bitten a given cat

There does not exist a dog such that there exists a cat where the following hold:
1) the cat has seen the dog
2) the cat has been bitten by the dog

$$\neg\exists x[D(x) \land \exists y(C(y) \land S(x, y) \land B(x, y))]$$

Another possible interpretation is:
If x is a Dog and y is a Cat and dog has been seen by cat, then dog has not bitten cat

$$\forall x[D(x) \rightarrow \forall y(C(y) \land S(x, y) \rightarrow \neg B(x, y))]$$

b)

The tallest dog bites at least one cat
There exists a dog which no dog is taller than and there exists a cat that the tallest dog has bitten

$$\exists x[D(x) \land \neg\exists y(D(y) \land T(y, x)) \land \exists z(C(z) \land B(x, z))]$$

c)

There are at least two cats that bit each other
There exists a cat x and a cat y such that x is not y, x has bitten y, and y has bitten x

$$\exists x[C(x) \land \exists y(C(y) \land x \neq y \land B(x, y) \land B(y, x))]$$

2 Prove

1	$\neg\exists y(\exists x F(x) \to F(y))$	ASS for IP
2	$\forall y \neg(\exists x F(x) \to F(y))$	QN 1
3	$\neg(\exists x F(x) \to F(c))$	UI 2
4	$\exists x F(x) \land \neg F(c)$	CN 3
5	$\exists x F(x)$	Simp 4
6	$\neg F(c)$	Simp 4
7	$F(c)$	ASS for EI
8	$\neg F(c)$	Rep 6
9	$F(c) \land \neg F(c)$	Conj 7,8
10	$\bot$	Contradiction 9
11	$\bot$	UI 5,7-10
12	$\exists y(\exists x F(x) \to F(y))$	IP 1-11

3 Symbolize and Prove

a)

Identity is transitive
$\forall xyz[(x = y \land y = z) \rightarrow x = z]$

1	$\neg\forall x\forall y\forall z[(x = y \land y = z) \rightarrow x = z]$	ASS for IP
2	$\exists x\neg\forall y\forall z[(x = y \land y = z) \rightarrow x = z]$	QN 1
3	$\neg\forall y\forall z[(c = y \land y = z) \rightarrow c = z]$	ASS for EI
4	$\exists y\neg\forall z[(c = y \land y = z) \rightarrow c = z]$	QN 3
5	$\neg\forall z[(c = b \land b = z) \rightarrow c = z]$	ASS for EI
6	$\exists z\neg[(c = b \land b = z) \rightarrow c = z]$	QN 5
7	$\neg[(c = b \land b = f) \rightarrow c = f]$	ASS for EI
8	$(c = b \land b = f) \land c \neq f$	CN 7
9	$c \neq f$	Simp 8
10	$(c = b \land b = f)$	Simp 8
11	$c = b$	Simp 10
12	$b = f$	Simp 10
13	$c = f$	LL 11,12
14	$c = f \land c \neq f$	Conj 12,9
15	$\bot$	Contradiction 14
16	$\bot$	EI 7-15
17	$\bot$	EI 5-16
18	$\bot$	EI 3-17
19	$\forall x\forall y\forall z[(x = y \land y = z) \rightarrow x = z]$	IP 1-18

b)

If $1 + 1 = 2$ and $3 - 1 = 2$ then $1 + 1 = 3 - 1$
let x represent 1+1
let y represent 2
let z represent 3 - 1
Show $(x = y \land y = z) \to x = z$

1	$x = y \land y = z$	ASS for CP
2	$x = y$	SIMP 1
3	$y = z$	SIMP 1
4	$x = z$	LL 2,3
5	$(x = y \land y = z) \to x = z$	CP 1-4

If we had access to functions like Plus(x,y) which return x + y, we could prove this more clearly. We only have access to T/F predicates, so I think this proof is the best I can do