CS 173, Spring 2015
Examlet 8, Part A

NETID:

FIRST:	LAST:

Discussion: Monday 9 10 11 12 1 2 3 4 5

(20 points) Suppose that $f : \mathbb{Z}^+ \to \mathbb{Z}$ is defined by

$f(1) = 3 \qquad f(2) = 5$

$f(n) = 3f(n-1) - 2f(n-2)$ for all $n \geq 3$.

Use induction to prove that $f(n) = 2^n + 1$

Proof by induction on n.

Base case(s):

Inductive hypothesis [Be specific, don't just refer to "the claim"]:

Rest of the inductive step:

CS 173, Spring 2015
Examlet 8, Part A

NETID:

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Discussion: Monday 9 10 11 12 1 2 3 4 5

(20 points) Suppose that $f : \mathbb{N} \to \mathbb{Z}$ is defined by

$f(0) = f(1) = f(2) = 1$

$f(n) = f(n-1) + f(n-3)$, for all $n \geq 3$

Use induction to prove that $f(n) \geq \frac{1}{2}(\sqrt{2})^n$ You may use the fact that $\sqrt{2}$ is smaller than 1.5.

Proof by induction on n.

Base case(s):

Inductive hypothesis [Be specific, don't just refer to "the claim"]:

Rest of the inductive step:

CS 173, Spring 2015
Examlet 8, Part A

NETID:	

FIRST:	LAST:

Discussion: Monday 9 10 11 12 1 2 3 4 5

(20 points) Suppose that $f : \mathbb{Z}^+ \to \mathbb{Z}$ is defined by is defined by

$f(1) = 5 \qquad f(2) = -5$

$f(n) = 4f(n-2) - 3f(n-1)$, for all $n \geq 3$

Use induction to prove that $f(n) = 2 \cdot (-4)^{n-1} + 3$

Proof by induction on n.

Base case(s):

Inductive hypothesis [Be specific, don't just refer to "the claim"]:

Rest of the inductive step:

CS 173, Spring 2015
Examlet 8, Part A

NETID:	

FIRST:	LAST:

Discussion: Monday 9 10 11 12 1 2 3 4 5

(20 points) Suppose that $f : \mathbb{Z}^+ \to \mathbb{Z}^+$ is defined by:

$f(1) = 3 \qquad f(2) = 7$

$f(n) = f(n-1) + 2f(n-2)$, for all $n \geq 3$

Use induction to prove that $f(n) \leq 3^n$

Proof by induction on n.

Base case(s):

Inductive hypothesis [Be specific, don't just refer to "the claim"]:

Rest of the inductive step:

CS 173, Spring 2015
Examlet 8, Part A

NETID:	

FIRST:	LAST:

Discussion: Monday 9 10 11 12 1 2 3 4 5

(20 points) Suppose that $P : \mathbb{N} \to \mathbb{N}$ is defined by

$P(0) = 2 \qquad P(1) = 1$

$P(n) = P(n-1) + 6P(n-2)$, for all $n \geq 2$

Use induction to prove that $P(n) = 3^n + (-2)^n$

Proof by induction on n.

Base case(s):

Inductive hypothesis [Be specific, don't just refer to "the claim"]:

Rest of the inductive step:

CS 173, Spring 2015
Examlet 8, Part A

NETID:	

FIRST:	LAST:

Discussion: Monday 9 10 11 12 1 2 3 4 5

(20 points) Suppose that $f : \mathbb{Z}^+ \to \mathbb{Z}$ is defined by

$f(1) = 0 \qquad f(2) = 12$

$f(n) = 4f(n-1) - 3f(n-2), \quad \text{for } n \geq 3$

Use induction to prove that $f(n) = 2 \cdot 3^n - 6$

Proof by induction on n.

Base case(s):

Inductive hypothesis [Be specific, don't just refer to "the claim"]:

Rest of the inductive step: