**ECS20**

**Homework 8: Induction**

***Proofs by induction.***

**Exercise 1:**

Show that  for all n ≥ 1.

**Exercise 2:**

Use mathematical induction to prove that:

 for all n ≥ 1.

**Exercise 3:**

Prove that:



Whenever *n* is a positive integer greater than 1.

**Exercise 4:**

Use mathematical induction to show that *n2-7n+12* is non negative if *n* is an integer greater than 3.

**Exercise 5:**

Use mathematical induction to prove that a set with *n* elements has *n(n-1)/2* subsets containing exactly two elements whenever *n* is an integer greater than or equal to 2.

**Exercise 6:**

Find the flaw with the following proof that *an=1* for all non negative integer *n*, whenever *a* is a non zero real number:

Basis step: *a0=1* is true, by definition of *a0*

Inductive step: assume that *aj=1* for all non negative integers *j* with *j ≤k*. Then note that:



**Exercise 7:**

Use mathematical induction to show that 21 divides  whenever *n* is a positive integer.

***Recurrence***

*In the following exercises, fn is the nth Fibonacci number.*

**Exercise 8:**

Prove that  whenever n is a positive integer.

**Exercise 9:**

Show that  whenever n is a positive integer.

**Extra credit:**

Use mathematical induction to prove that a set with *n* elements has *n(n-1)(n-2)/6* subsets containing exactly three elements whenever *n* is an integer greater than or equal to 3.