## Math 2534 Homework 8 Spring 2018 (due March 21)

Show all work. Use complete sentences. Staple multiple sheets.

## Problem 1:

Theorem: for all natural numbers. If  $f(x) = \ln x$ , then the n<sup>th</sup> derivative  $f^{(n)}(x) = \frac{(-1)^{n-1}(n-1)!}{x^n}$ (Remember that 0! = 1)

**Problem 2**: Given the recursive sequence  $a_1 = a_2 = 1$  with  $a_n = (a_{n-1})^2 + a_{n-2}$  for  $n \ge ??$ 

- a) Find the least value of n where n is an natural number.
- b) Find the next 4 terms in this sequence

**Problem 3**: Given the sequence 1, 7, 49, 343, ....,

- a) Find the function sequence representation f(n)
- b) Find the recursive representation  $a_n$

**Problem 4:** Given the recursive sequence:  $a_1 = 1, a_2 = 1$  and  $a_n = 2a_{n-1} + 3a_{n-2}, n \ge 3$ , Show that  $a_n < 2(3^{n-2})$  for all  $n \in N$ , n > 2.

## Problem 5:

Theorem: If  $a_1 = 1$  and  $a_2 = 2$  and  $a_n = a_{n-1} + 2a_{n-2}$  for all  $n \ge 3$  and  $f(n) = 2^{n-1}$ , then  $a_n = f(n)$  for all natural numbers..

## Problem 6:

Theorem: Given the Fibonacci sequence  $f_n$ ,  $f_1 + f_3 + f_5 + ... + f_{2n-1} = f_{2n}$   $\forall n \in N$ 

**Problem 7:** A group of people stand in line to purchase concert tickets. The first person in line is a women and the last person is a man. Use PMI to show that somewhere in the line a woman will always be directly in front a man.