# MA 330 HOMEWORK
# DUE WEDNESDAY, MARCH 13

This problem set may be handwritten. Recall we can write the binomial coefficients (aka entries in Pascal's triangle) as

$$\binom{n}{k} = \frac{n(n-1)(n-2)\cdots(n-k+1)}{k!},$$

where

$$(1+x)^n = \sum_{k=0}^{\infty} \binom{n}{k} x^k.$$

Note that for $k > n$, $\binom{n}{k} = 0$, so there are only finitely many terms on the right side in the above equation.

**Problem 1:** Expand the following as infinite series by using Newton's binomial theorem.

(1) $\frac{1}{1-x}$. (Note that this is the usual geometric series.)
(2) $\frac{1}{(1-x)^n}$, for positive integers $n$.

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**Problem 2:** Using Newton's method for computation of square roots given on page 170 of *Journey Through Genius*, compute the following to 5 decimal points accuracy (you can check your answer with a calculator).

(1) $\sqrt{3}$
(2) $\sqrt{5}$

**Problem 3:** Prove that

$$\frac{1}{\sqrt{1-4x}} = \sum_{k=0}^{\infty} \binom{2k}{k} x^k.$$

*Hint: You might need to know that*

$$\frac{2^n \cdot 1 \cdot 3 \cdot 5 \cdots (2n-1)}{n!} = \frac{(2n)!}{(n!)^2}.$$