# MATH 481: HOMEWORK 1

(1) (a) How many possible outcomes are there if we roll a six-sided die two times or flip a coin three times?

(b) How many ways are there to flip a coin ten times and get heads at least six times?

(2) Sec. 2.1 #2.

(3) Given a real number $x$, prove the following formula:

$$\binom{x+2}{3} - \binom{x}{3} = x^2$$

(4) Let $a$ and $b$ be positive integers. How many paths are there from $(0,0)$ to $(a,b)$ if we are only allowed to increase one of the coordinates by one at each step? For example, there are two paths from (0,0) to (1,1): either $(0,0) \to (0,1) \to (1,1)$ or $(0,0) \to (1,0) \to (1,1)$.

Hint: Such a path can be represented as a sequence of $x$'s and $y$'s.

(5) Draw the following graph: the vertices are the binary sequences of length 4, and we draw an edge between any two sequences that are related by changing a zero to a one. All the edges in your drawing should be straight lines of the same length.