Math 20
Homework 2
Due: July 8, 2015

Solve the following problems and explain your reasoning.

Book problems: 3.1.3, 3.1.8, 3.1.10, 3.1.23, 3.2.10, 3.2.13, 3.2.20, 3.2.35, 3.2.36

10) (a) Give an example of two positive sequences a_n and b_n such that $a_n \sim b_n$ however $\lim_{n \to \infty} |a_n - b_n|$ diverges to infinity. This shows that the *absolute error* of two asymptotically equivalent sequences need not be bounded.

(b) Prove that if $a_n \sim b_n$ and $\lim_{n \to \infty} b_n \neq 0$, then the *relative error* goes to zero. That is, prove:
$$\lim_{n \to \infty} \left| \frac{a_n - b_n}{b_n} \right| = 0.$$

11) Find a formula for:
$$\sum_{k=0}^{n} \binom{4n}{4k}$$
that does not involve $\sum$ or ... [Hint: If $i = \sqrt{-1}$ then $(1+i)^4 = (1-i)^4 = -4$.]