Physics 306: Mathematical Methods
in the Physical Sciences
Fall 2016

Problem Set 2

Due: Fri 9 Sep 2016

Reading: The reading corresponding to lecture on Fri 2 Sep is the remainder Chapter 1 of Boas. Have a happy Labor Day Weekend, and for Wed 7 Sep, please read Secs. 1 through 7 of Chapter 2.

Problems (in Boas 3rd Ed): Here, “Boas 1.13.2” means Problem 2 of Section 13 of Boas Chapter 1.

1. Boas 1.13.2. Note that the result of this problem implies that
\[(1 - x)^{-1} = 1 + x + x^2 + \cdots. \tag{1}\]

2. Generalize the previous result to show that \((-m)_n = (-1)^n \binom{m+n-1}{n}.

3. By combining the results of Problems 1 and 2, the coefficient of \(x^n\) in
\[(1 - x)^{-m} = \underbrace{(1 + x + x^2 + \cdots)(1 + x + x^2 + \cdots) \cdots (1 + x + x^2 + \cdots)}_{\text{m factors}} \tag{2}\]
is \(\binom{m+n-1}{n}\). Use this observation to argue that the number of ways to put \(n\) indistinguishable balls in \(m\) distinguishable boxes is \(\binom{m+n-1}{n}\).
