

Physics 3513, Homework #1 (due 9/3)

The numbers in parentheses after the problem number indicate points for each problem.

P1(10) (Boas 6.7) Test for convergence using the integral test: $\sum_{n=2}^{\infty} \frac{1}{n \ln n}$

P2(10) (Boas 6.24) Test for convergence using the ratio test: $\sum_{n=1}^{\infty} \frac{3^{2n}}{2^{3n}}$

P3(10) (Boas 9.9) Test for convergence: $\sum_{n=1}^{\infty} \frac{n^n}{n!}$

P4(10) (Boas 10.14) Find the interval of convergence: $\sum_{n=1}^{\infty} \frac{n}{n+1} \left(\frac{x}{3}\right)^n$

P5(10) (Boas 10.16) Find the interval of convergence: $\sum_{n=1}^{\infty} \frac{(x-1)^n}{2^n}$

P6(10) (Boas 15.23a) Find the limit using Maclaurin series: $\lim_{x \rightarrow 0} \left(\frac{1}{x} - \frac{1}{e^x - 1} \right)$

P7(20) By differentiating both sides of the equality $\frac{1}{1-x} = \sum_{n=0}^{\infty} x^n$, find the sum of the following series: (a) $\sum_{n=1}^{\infty} nx^n$; (b) $\sum_{n=1}^{\infty} n^2 x^n$.

P8(20) Determine for which values of x the following series converge:

(a) $\sin x + \sin^2 x + \sin^3 x + \dots$

(b) $\sin x \cos x + \sin^2 x \cos^2 x + \sin^3 x \cos^3 x + \dots$